ENCLOSURE 2
GLOUCESTER CO.

DEPARTMENT OF PUBLIC WORKS
P.O. Box 329
Gloucester, Virginia 23061

Birkhofer Building
6515 Main Street

BUILDINGS & GROUNDS
(804) 693-5250

ENGINEERING
(804) 693-5480

TRANSMITTAL MEMORANDUM

To: Joseph Thompson, Grants and Local Aid Manager
Virginia Department of Fire Programs

From: Lindy Harper, Public Works Engineer
Gloucester County

Department of Fire Programs
NOV 19 2013
Administration

Date: November 18, 2013

Subject: Grant Application

Attached please find a completed grant application for the replacement of the roof on our Fire Training Facility. This application is made as a result of the existing roof being found deficient by The Structures Group (TSG) during their five year structural evaluation. In transmitting TSG's report, the Virginia Department of Fire Programs notified the County that firefighter training conducted at the facility will be decertified on December 31, 2013 if this remedial repair is not completed and that grant funds are available to complete the required work. The application requires several supporting documents which are included and marked as follows.

A Grant Application
Under Section C.1., the "other" burns are characterized as Company level training, Gloucester and other jurisdictions.

B Biennial Maintenance Inspections required by Section C.4.
1. Report from Elliot, LeBoeuf & McElwain dated February 12, 2009
2. Report from Elliot, LeBoeuf & McElwain dated March 15, 2011
The five (5) year evaluation conducted by The Structures Group dated October 15, 2012 and revised May 10, 2013 is not included with this application as a copy is on file with the Virginia Department of Fire Programs.

C Per Section D.2., existing building plans which highlight the proposed renovation

D Per Section E.1.a., the estimated project budget and contractor's estimate

E Gloucester County Board of Supervisors resolution authorizing this application

If any required documents are missing, or if you have any questions, please contact me. Also, please notify us if our attendance is required at any Board or Subcommittee meetings.

A

ATTACHMENT A

Commonwealth of Virginia
Department *of* Fire Programs

Burn Building Grant Application
Construction, Renovation, or Repair

A. Applicant Information		
1. Title of Jurisdiction Making Application (Check ☑ only one, then make entry)	x	County of Gloucester
		City of
		Incorporated Town of
2. Employer Identification Number (EIN)	54-6001312	
3. Principal Point of Contact	(Include salutation, name & title.) Garrey W. Curry, Jr., P.E., Assistant County Adminstrator	
4. Mailing Address (Include zip code+4)	6467 Main Street Gloucester, VA 23061	
Identify **COUNTY** if appropriate →	Gloucester County	
5. Telephone Number	(804 693-5480	
6. FAX Number	(804 693-1481	
7. Internet e-mail address	gcurry@gloucesterva.info	
8. Application Scope (Check ☑ only one)	x	**Sole** Jurisdiction as identified in [A]
		Multiple Jurisdictions - Complete [F]

B. Facility Information (Burn Building)	The term "burn building" refers to an unoccupied structure. The purpose of the Burn Building is to provide live fire training to fire service personnel in support of Fire Fighter I and Fire Fighter II Training throughout the Commonwealth of Virginia.
1. Current / Proposed **Owner** of Facility	(Party **holding /to hold** title to the property) Gloucester County
2. In-Service Date or Age of Structure	(Leave blank if NOT an existing structure as reported in [C1] below.) Date 10/01/07 ☐ Unknown If unknown, enter approximate age in years
3. Address of Structure (If appropriate, identify COUNTY where located.)	7598 Dutton Road Gloucester, VA 23061
4. Will the renovation or repair bring the the burn building into compliance with the current standard of NFPA 1403, including appropriate NFPA 1403 signage? If no, explain in **6. Comments**.	☐ Yes ☐ No ☒ N/A
5. Will the construction of the burn building be in compliance with the current edition of Sections I through IV of the Summary of Burn Building Prop Grant Program as included in the VDFP Project Manual for Burn Building Props and the current standard of NFPA 1403? If no, explain in **6. Comments**.	☐ Yes ☐ No ☒ N/A
6. Comments (pertaining to Facility)	x None

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C. Facility Usage

1. Number of annual burns
(must be documented)

(for New construction, this figure is projected)

VDFP FFI burns (in compliance with NFPA 1403 standards)	1
VDFP FFII burns (in compliance with NFPA 1403 standards)	1
Other Burns (specify types of burns)	10

2. Travel to another facility

Distance traveled to closest alternate facility (in miles)	22
Time traveled to closest alternate facility (rounded to whole hours)	1

3. Other localities served
(list number of stations and number of firefighters served for each locality)

(for New construction, this figure is projected)

(if more than 5 localities are served, additional localities must be included on Additional Localities Served tab)

Name of Locality	Gloucester County
Number of stations	6
Number of Firefighters	300
Name of Locality	Middlesex County
Number of stations	4
Number of Firefighters	100
Name of Locality	King & Queen County
Number of stations	1
Number of Firefighters	25
Name of Locality	Mathews County
Number of stations	5
Number of Firefighters	100
Name of Locality	
Number of stations	
Number of Firefighters	
TOTAL NUMBER OF STATIONS SERVED (from above and add')	16
TOTAL NUMBER OF FIREFIGHTERS SERVED (from above and add')	525

4. Maintenance of facility

(for New construction, skip Section C.4. Section E.2. MUST be completed)

Annual Maintenance Inspections (documentation of annual inspections MUST be provided with application for inspections conducted after 12/2007)	X	Yes		No
Previous Repair Projects (documentation MUST be provided with application for most recent repairs)		Yes	X	No

D. Project **Description**

1. Level of work proposed (Check ☑ only one)

- [ ] NEW Construction where no such structure previously existed
- [X] RENOVATION of an existing burn building or substantially similar structure
- [ ] REPAIR of an existing burn building (up to $10,000)

2. Type of Building (proposed or existing)

- [ ] Class A fuel
- [X] Class B fuel
- [ ] Prototype I plans (brick, block, concrete)
- [ ] Prototype II plans (steel frame)
- [x] Other*

1,500 Square Footage of Building (proposed or existing)

1 Number of Burn Rooms on 1st floor

1 Number of Burn Rooms on 2nd floor

For New Construction:

***If building plans deviate from Prototype I or II, applicant MUST define building concept and include proposed plans with application.**

For Renovations or Repairs:

***If building plans deviate from Prototype I or II, applicant MUST include copy of existing building plans with proposed renovations/repairs.**

3. Architectural and/or Engineering (A/E) (Check ☑ only one for each)

Has an A/E study already been completed?

[ ] Yes [X] No [ ] Not Applicable

If so, is a copy attached to this application?

[ ] Yes [X] No [ ] Not Applicable

4. Condemnation and/or fitness for use

(Leave [C4] blank if this application is for totally **new** construction; otherwise Check ☑ only one for each statement.)

Is this structure still in use for certification of FFI and FFII at the time of application?

[X] Yes [ ] No

If yes, is there currently a scheduled date to remove the structure from service? [X] Yes [ ] No

If yes, enter the month & year: Dec-13

If not presently in service, has this structure been condemned by a building official or other such entity legally empowered to do so? [ ] Yes [X] No [ ] Not Applicable

If yes, is a copy of such order attached to this application?

[ ] Yes [ ] No [X] Not Applicable

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E. Financial Plan 1. **Project Budget** (Capital Expend)	An estimated project budget must be attached to this application. For renovation/repair projects, contractor estimates must be attached.
a. ***Expense***	
i. Estimated Cost of Construction (Enter or check ☑)	$ 20,071.70 ☐ Unknown at time of application
ii. Estimated A/E Costs (Enter or check ☑)	$ 5,000.00 ☐ Unknown at time of application
iii. Estimated Total Costs (Enter or check ☑)	$ 25,071.70 ☐ Unknown at time of application
b. ***Revenue***	
i. Grant Funding Being Requested New construction maximum $430,000	$ 25,071.70
ii. Matching / Cost Share Funds	$ -
iii. Source of Matching Funds (local contributions, donations, etc.)	N/A
2. **Operating Budget** (Maint. Expend)	
a. Is there a financial agreement among partnering localities?	☐ Yes ☒ No ☐ Not Applicable
b. Is there a local budget for annual maintenance costs?	☒ Yes ☐ No
c. Is there a local budget for annual inspection costs?	☒ Yes ☐ No
d. Is there a local budget for 5-year inspection costs?	☒ Yes ☐ No

F. **Additional Parties** of Interest (Mark N/A and skip section [D] if not applicable - see [A.8])	Identify hereunder ALL **jurisdictions** (Not their Departments) otherwise participating in the proposed project. Attach additional sheets as may be required.
1. NON-Applicability	[X] No parties other than the jurisdiction identified in [A] above.
2. Formal Agreement Among Parties	Is there a formal agreement among parties with regard to the **proposed project?** [ ] Yes [ ] No If yes, is a copy attached to this application? [ ] Yes [ ] No Is there a formal agreement among parties with regard to the **shared use of the facility?** [ ] Yes [ ] No If yes, is a copy attached to this application? [ ] Yes [ ] No

(Reproduce and complete as many additional blocs as may be necessary for complete disclosure.)

2a.	Complete one each for ALL other Parties of Interest	Number [ ] of a total of [ ] parties to proposed project (Count the LEAD Locality as #1, thereby start with #2.)
2b.	Title of Jurisdiction (Check ☑ only one, then make entry)	[ ] County of [ ] City of [ ] Incorporated Town of
2c.	Employer Identification Number (EIN)	[ ][ ]-[ ][ ][ ][ ][ ][ ][ ]
2d.	Principal Point of Contact	(Include salutation, name & title.)
2e.	Mailing Address Identify **COUNTY** if appropriate →	(Include zip code+4)
2f.	Telephone Number	( )
2g.	FAX Number	( )
2h.	Internet e-mail address	

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G. Electronic Transfer of Funds Information

Note ☞ The completion of this section is optional at the time of application and will not hinder determination of eligibility, etc. However, if not provided and since funds will only be transferred electronically, disbursement will be delayed until this information is properly provided.

1. Account Ownership Information

Employer Identification Number ☐☐---☐☐☐☐☐☐☐☐☐

SSN may **NOT** be substituted.

Complete next three (3) entries ONLY if Name is different than ACCOUNT TITLE as it appears in [E2].

NAME (Last, First, Initials) _____

MAIN (Telephone Number) _____

ALTERNATE (Telephone Number) _____

2. Direct Deposit Account Information

(Check ☑ one Type of Account) ☐ Checking ☐ Savings

ROUTING TRANSIT NUMBER (9 digits) _____

ACCOUNT NUMBER _____

ACCOUNT TITLE _____

FINANCIAL INSTITUTION _____

Note – This section of the application MUST be properly executed for the application to be complete. Certification may be completed by:

- City Manager /or/ Deputy
- County Administrator /or/ Deputy
- Town Manager /or/ Mayor
- Or other duly authorized official but only when the application is accompanied by a copy of an 'Ordinance' or other formal instrument clearly granting that party such authority.

Only completed applications can be acted upon.

CERTIFICATION

This application is made on behalf of the jurisdiction above described [A] with the full knowledge and belief that all representations herein made are true and correct.

Brenda G Garton — Signature | 11/7/13 — Date

Brenda G. Garton — Printed Name | County Administrator — Title

(All applications **must** be notarized to be considered – incomplete forms shall be returned.)

State of Virginia }
}
~~City~~ / County of GLOUCESTER }

On this 7th day of NOVEMBER (month) in 2013 (year), before me, the undersigned a Notary Public for the Commonwealth of Virginia, personally appeared BRENDA G GARTON to me known (or to me proved) to be the identical person named herein and having in my presence executed the above, and acknowledged that he executed same as his voluntary act and deed.

My Commission expires: 9/30/2016 — Date

Patricia Lynn Cronin — Notary Public {Seal}

Department of Fire Programs

NOV 19 2013

Administration

Patricia Lynn Cronin
Commonwealth of Virginia
Notary Public
Commission No. 7516841
My Commission Expires 9/30/2016

Elliott, LeBoeuf & McElwain

Phone (703) 321-2100
Fax (703) 321-2112

8001 Forbes Place Suite 201
Springfield, VA 22151
www.elaengineers.com

Report on the:

Structural Survey and Evaluation

18

At the:

Gloucester Live Fire Training Structure ("Burn Building")
EL&M No.: 08042

Prepared for:

Gloucester Volunteer Fire & Rescue Squad Inc.

Prepared by:

Rebecca M. Hallinan
Training Center Designer

Roger M. LeBoeuf, P.E.
President

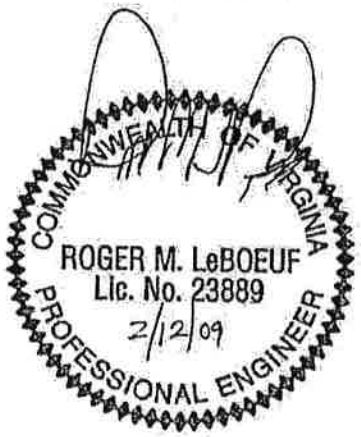
Department of Fire Programs

NOV 19 2013

Administration

Date:

February 12, 2009



Received

MAR 05 2009

Public Works

Elliott, LeBoeuf & McElwain

Phone (703) 321-2100
Fax (703) 321-2112

8001 Forbes Place Suite 201
Springfield, VA 22151
www.elaengineers.com

Transmittal

Date: February 27, 2009

Delivery to: Gloucester Volunteer Fire & Rescue Squad Inc.
Attention: Capt. Gordon Townsend
Job Name: Gloucester Live Fire Training Structure ("Burn Building") Structural Evaluation
EL&M No.: 08042

Delivered by: Fed Ex

Items: Report

Prepared by: Our office

EL&M Action: For your use and information

Your Action: Please call if you have any questions

Comments: Thank you for the opportunity to provide you with our professional services. We hope to provide this evaluation service for you again in the future.

By:

Roger M. LeBoeuf, P.E.
President

Copies to: N/A

Telephone Extensions:

Insuk Brouillard	109	Keon DeRoche	110	Tiwana Hicks	106
Raymond Kovachik	108	Roger LeBoeuf	101	Jonathan McElwain	102
Rebecca Hallinan	(781) 419-9835			Jeremy Jones	(717) 733-9010

Table of Contents

Table of Contents - Appendices

1. Introduction

1.1 Purpose of Survey

The "burn building" at the Gloucester, VA live fire training facility is a live fire training structure located at 7598 Dutton Rd., Gloucester, VA 23061. It is used for training firefighters in live fire training evolutions.

The purpose of this survey is to determine the extent of any structural damage and make recommendations. Accomplishing this purpose will keep the Owner in conformance with NFPA's requirements for structural surveys of the burn building for one year.

1.2 Description of Survey at this Burn Building

To accomplish the purpose, Mrs. Rebecca Hallinan, of Elliott, LeBoeuf & McElwain (EL&M), traveled to the site on January 26, 2009 to conduct a visual structural survey. Upon arriving at the burn building for the field survey, Mrs. Hallinan interviewed Captain Gordon Townsend of Gloucester Volunteer Fire & Rescue Squad. The interview included a walk-through of the burn building. During this interview, Mrs. Hallinan obtained information about the burn building history, condition, and use. Mr. Townsend pointed out damage and enumerated specific concerns about the burn building.

After the interview and walk-through, Mrs. Hallinan conducted a non-destructive, visual structural survey of the burn building. Visual observations were made of exposed surfaces in every accessible room for the purpose of evaluating the general condition of the existing structural systems. Furthermore, the exposed top surface of the elevated floor slab was sounded in an attempt to locate delaminations. The exterior was observed from the ground and accessible roof locations.

The survey did not include soils testing, materials testing, evaluation of structural load capacity, or evaluation of non-structural items, such as sprinkler pipes, smoke exhaust system, temperature monitoring system, electrical wiring, or any items beyond the exterior walls of the burn building. The only non-structural items included in the survey were doors, window shutters, guardrails, thermal linings, and any other items indicated in the report. The assessment of non-structural items was limited to a visual assessment of their general condition. Testing and inspections were not performed on the non-structural items. For example, door and shutter hinges were not inspected or tested for wear or risk of failure. Evaluation of code compliance and other safety issues was not included in the scope of work. For example, visible door and window deterioration, loose guardrails, and damaged linings were documented. Code compliance issues such as door and window dimensions, egress requirements, and guardrail heights were not included.

This survey does not include a structural evaluation of load capacity or building stability. The scope of the evaluation was limited to a structural evaluation. Therefore, evaluations

of fuel loads, training temperatures, training procedures, and other operational items were not performed.

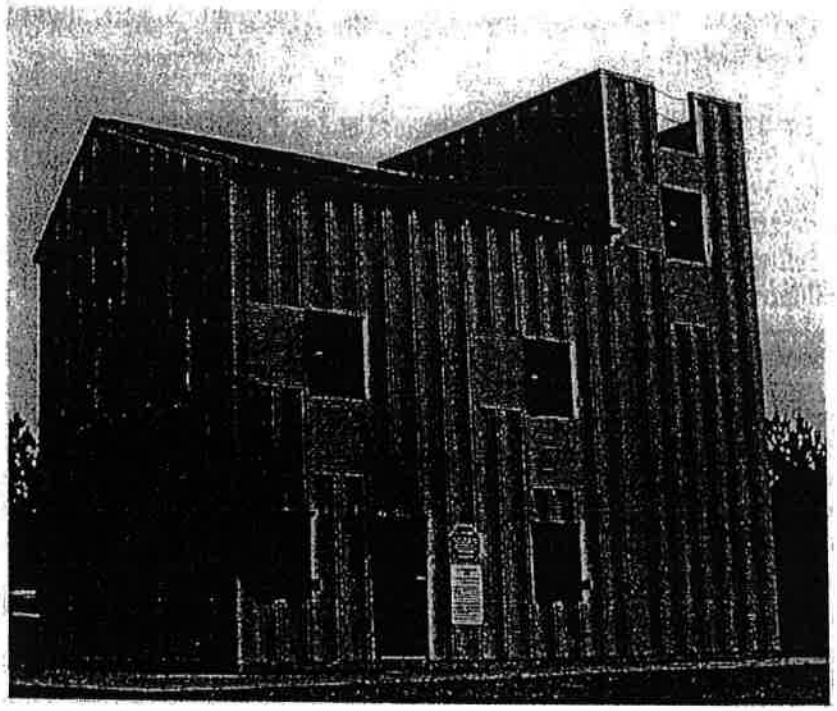
A partial set of the original architectural and structural drawings were available for review during the survey. These drawings were prepared by WHP of Overland Park, Kansas and dated March 14, 2007. The drawings were spot-checked in the field and were found to be a generally accurate representation of the exposed conditions. We have assumed that the drawings accurately reflect the as-built conditions of the existing structure, including the hidden conditions such as slab reinforcing.

The visual survey is a useful method for determining the general structural condition of the burn building. However, without exposing every hidden condition and without testing any of the structural materials for deterioration, the survey is not exhaustive. It is possible for damaged structural elements to appear undamaged at the exposed surface. There may be damage that was not detected during this survey and future damage can occur due to continued live fire training evolutions. Therefore, while it is believed that the survey and testing provides a good general assessment of the building condition, the results of this survey cannot be considered a warranty of the structural condition of the burn building. Furthermore, the survey results cannot be used, in themselves, as contract documents for repairs.

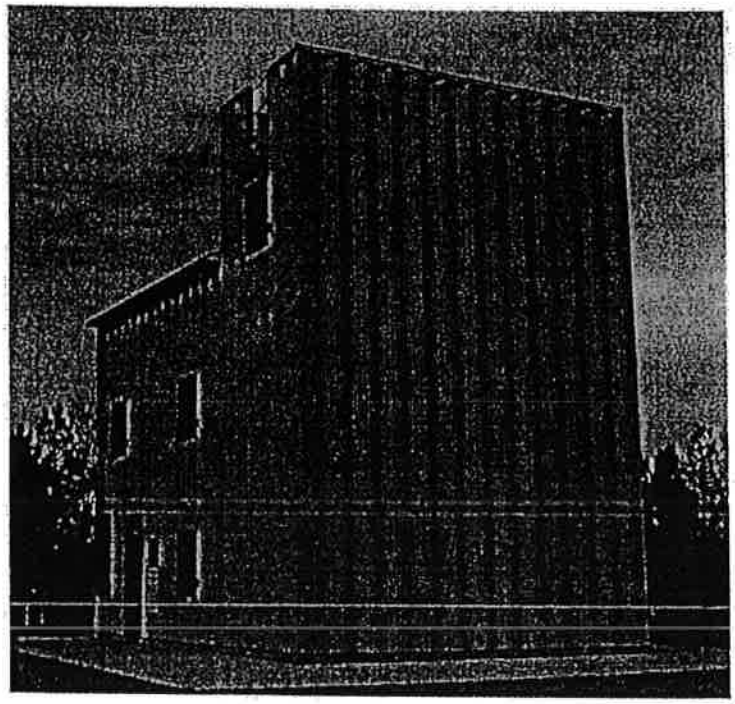
2. Burn Building Description

See Appendix 1 for approximate floor plans. For a glossary of all terms typed in *italics*, see Appendix 2.

The burn building is a three story pre-engineered steel structure measuring approximately 2,650 square feet. Most of the third floor is low headroom attic. There is currently one burn room (room used for live fire training). The burn building is approximately one year old (constructed in November, 2007).



CD Elevation (above) and BC Elevation (below)



2.1 Structural Systems

The burn building is a pre-engineered steel structure. The structure consists of *lightgage metal C joists* supporting lightgage metal deck, supported by corrugated structural wall panels. The second floor non-burn room has a non-structural concrete topping on the metal floor deck. The ground floor is a *slab-on-grade*. The walls are supported on spread footings. These descriptions are based on the original drawings and observed conditions. The foundations were not excavated for observation.

2.2 Non-Structural Features

The non-structural features are described in the table below.

Element	Description
Exterior & Interior Doors	Hollow metal door
Windows	Hollow metal shutters (double swing) with locking mechanism.
Roof Hatches	Bilco roof hatch, openings with wood cover panels.
Floor Hatches	Bilco floor hatch
Thermal Lining	Super Padgenite insulating panels (1" thick calcium silicate insulation boards) on interior wall and ceiling surfaces of the burn room only, mounted on steel stud partitions and hung from steel hat channels from the ceiling structure.

2.3 Use of Facility, Based on Questionnaire and Interview with Facility Personnel

The following table describes the general use of this burn building, as provided by personnel from the facility. The information provided in this table gives an indication of the general care and condition of the burn building. Typically, one can expect to observe more damage in the building if there are one or more of the following: higher temperatures, frequent training evolutions, misuse, no thermal protection, and no routine maintenance.

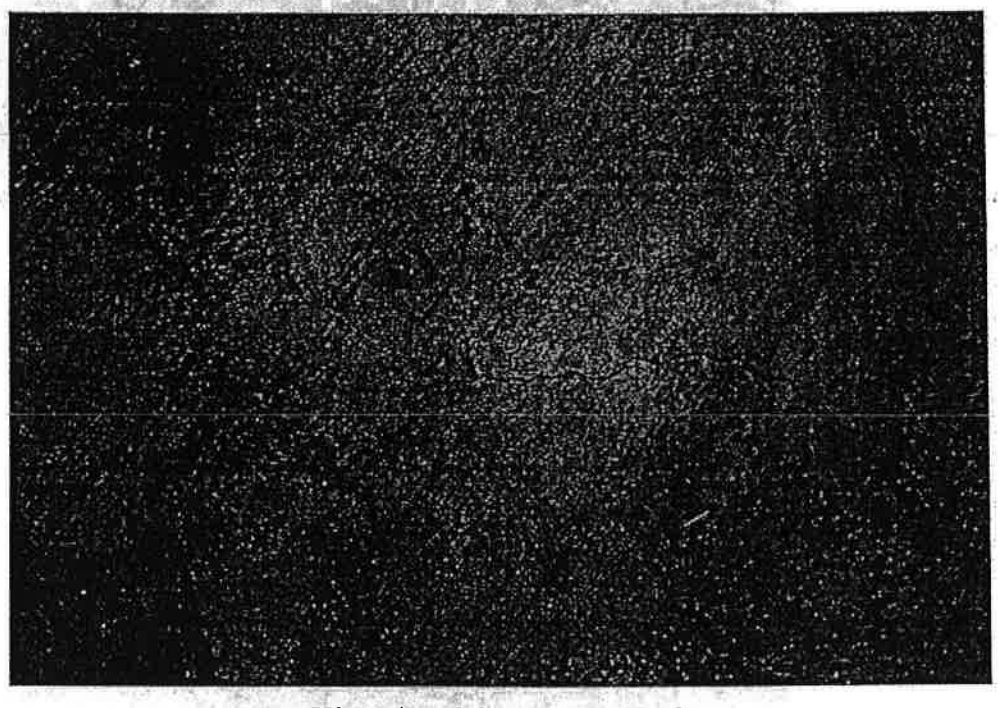
Item	Information Provided by Captain Gordon Townsend
Personnel that use the burn building	Gloucester volunteer fire department, marine training company in the area, open to anybody in the area that wants to use the building for training.
Degree of supervision (See Note 1 below)	Gloucester safety officer per NFPA regulations.
Number of live fire training days (days during which at least one fire was set) per year in this burn building	Less than 10.
Temperature range during training	Temperatures in compliance with NFPA regulations, though no temperatures reported to EL&M.
Typical fuel used for one evolution	Pallets and straw. An LP gas prop vendor is coming to look at the building next week.
Damage to the structure that has either changed training routine or raised concerns about safety	None.
Past repairs and renovations	Replaced broken handle on vent door in burn room. Added chains and hooks to doors in order to keep them in open position. Window at D side of building on third floor bolted shut for safety.
Maintenance history	None.
Planned changes for the future	Add second burn room upstairs and an exterior fire escape stair. Add railings to the sloped roof.
Other information	Certified for use in November/December 2007.

Note 1: "Degree of supervision" indicates the degree to which the local fire training academy supervises training at the burn building. This supervision requires personnel from the local fire training academy to either be the instructors or to observe the evolutions conducted by an outside instructor. It has been noted during past surveys that "unsupervised training" often results in misuse of the building, including burning at temperatures that are too high and burning in rooms that are classified as "no burn" rooms.

3. Observations and Recommended Actions

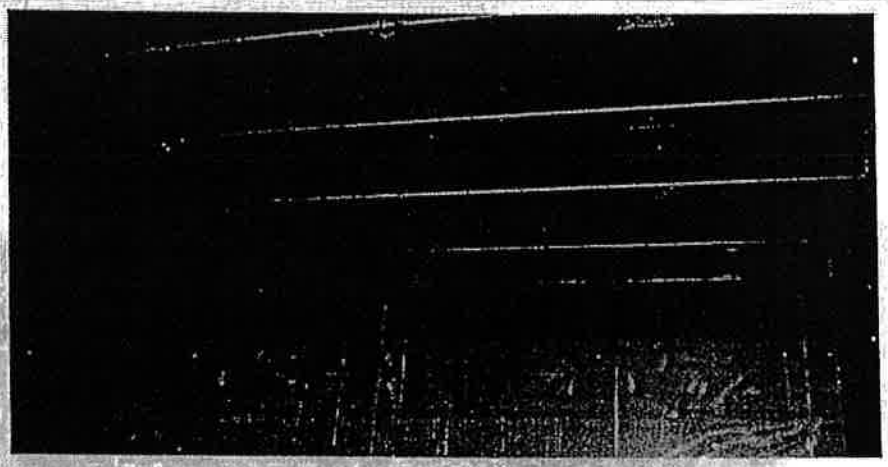
The following defects were observed. Recommended actions for repairing the defects are provided in the following table.

Item	Observations and Recommended Actions
Concrete slab-on-grade	Observations: Minor *cracks*, most likely due to concrete shrinkage during the initial curing exist in the top surface of the slab-on-grade. Recommended Actions: No repair required since the concrete is not structural. Observe cracks periodically to determine if their condition is worsening. Should any crack grow to exceed 1/16" in width, then repairs will be required.

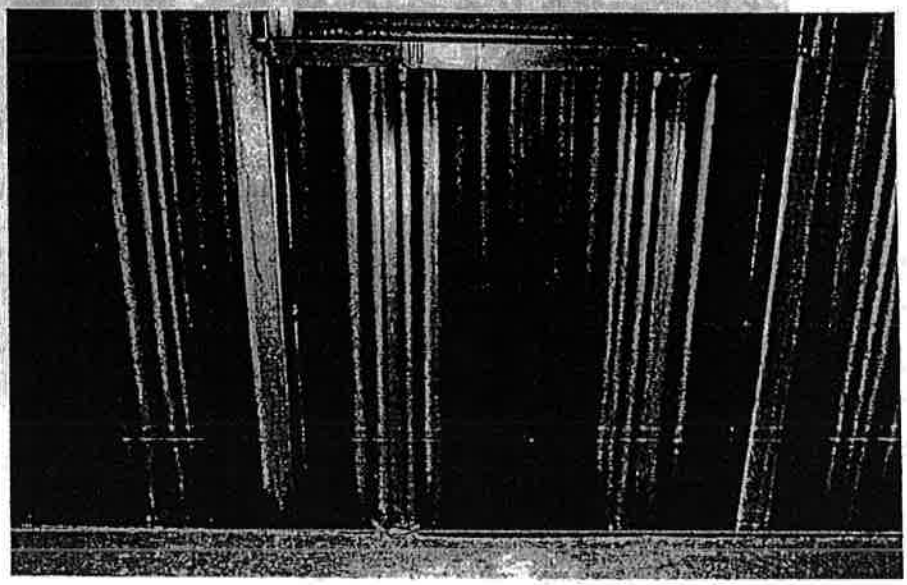


Minor crack in slab-on-grade

Item	Observations and Recommended Actions
Steel Framing	Observations: There is minor corrosion on the steel framing (floor and roof deck, C joists, roof trusses, wall studs, corrugated wall panels) throughout the structure. Recommended Actions: No repair is required at this time because the corrosion appears to be minor surface rust. Monitor the corrosion. If it worsens, corrosion removal and re-coating would be required.

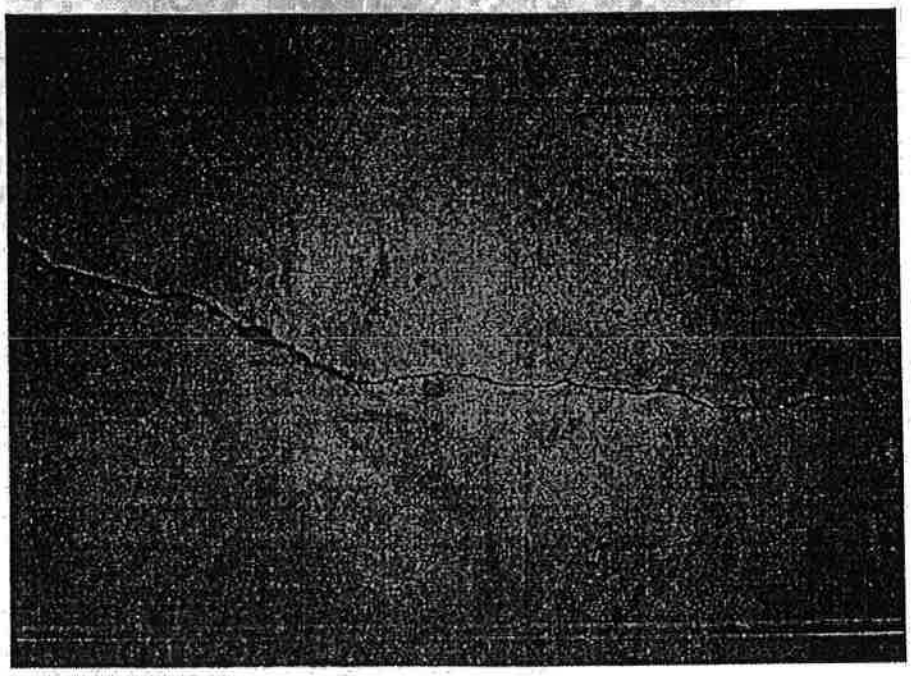


Minor corrosion on wall and C joists



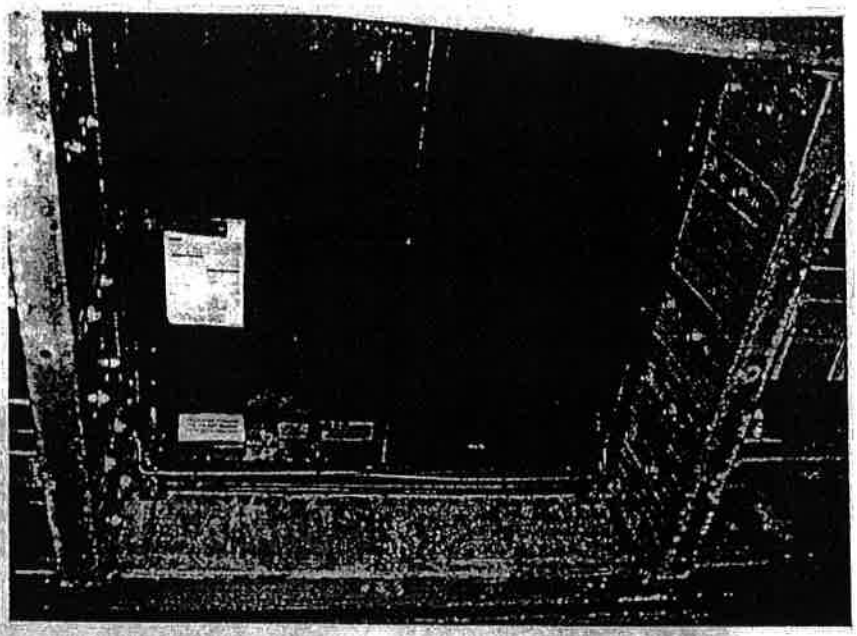
Minor corrosion and heat exposure on second floor walls

Item	Observations and Recommended Actions
Concrete topping at floors and roof	Observations: Minor to moderate *cracks*, most likely due to concrete shrinkage during the initial curing and thermal expansion and contraction during live fire training, exist in the top surface of the concrete topping at the second floor. Recommended Actions: Seal cracks that are wider than 1/16" thick. Options include routing and sealing with a flexible sealant, such as Sikaflex 1a, or epoxy injection with Sikadur 52 or an equivalent product. The remaining cracks that are less than 1/16" thick do not require repairs at this time but should be monitored for further deterioration. The floor of the burn room should be covered with fire brick to help prevent future cracks and *spalls* and to help prevent the sealant from melting.



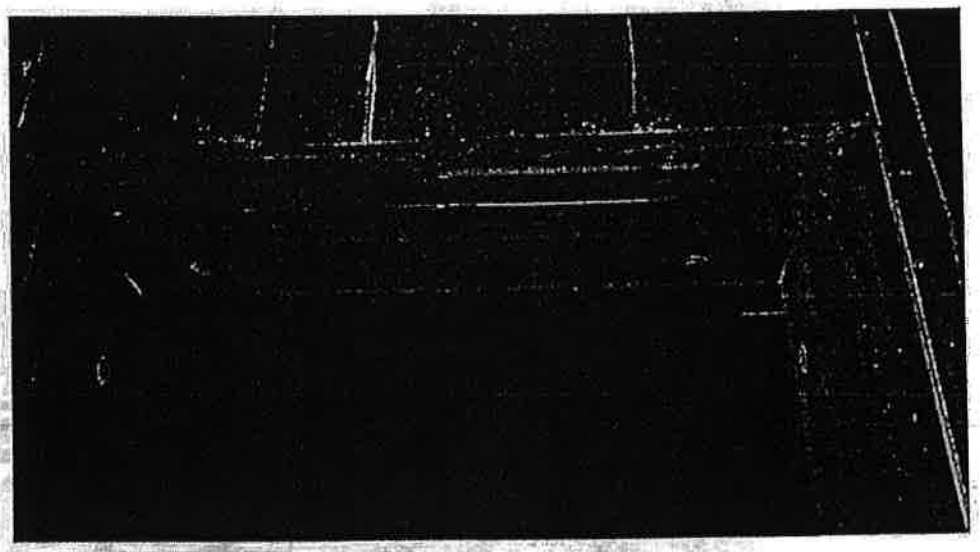
Crack in second floor concrete topping

Item	Observations and Recommended Actions
Floor and Roof hatches	Observations: Minor corrosion on floor and roof framing around openings. Recommended Actions: No repair required.



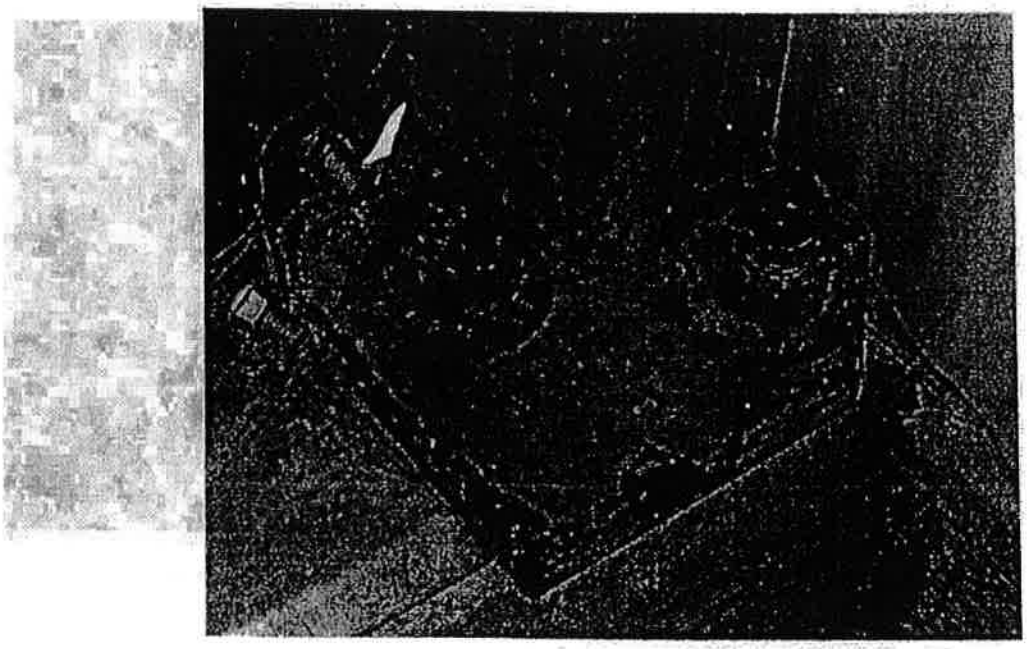
Minor corrosion on second floor hatch

Item	Observations and Recommended Actions
Doors and Windows	Observations: Minor corrosion and peeling paint on hollow metal doors, shutters, shutter magnets, and frames. Recommended Actions: No repair required.



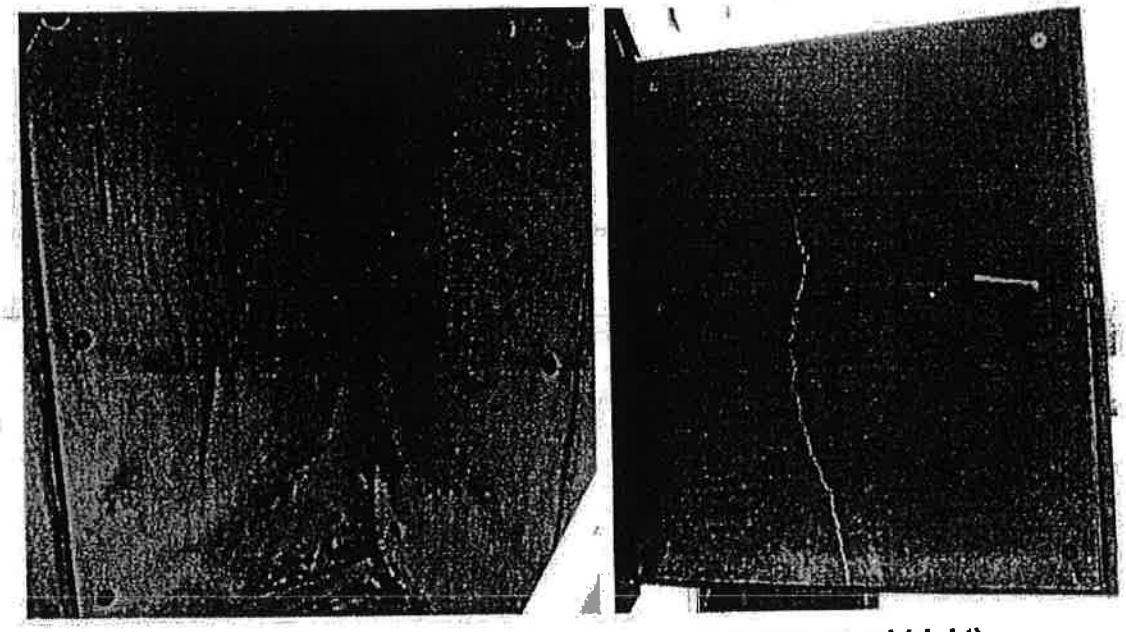
Minor corrosion on door frame into burn room

Item	Observations and Recommended Actions
Wall panel base plates and anchor bolts	Observations: There is minor corrosion on the base plates and anchor bolts at all wall panel intersections. Recommended Actions: Remove corrosion and provide two coats of galvanizing repair paint.



Minor corrosion on wall panel intersection base plate and bolts

Item	Observations and Recommended Actions
Thermal Lining	Observations: There are four cracked Super Padgenite wall panels in the burn corner of the burn room, plus two cracked ceiling panels and one cracked panel on the window shutter. There is one chipped panel at the exterior door jamb of the burn room. Recommended Actions: Replace panels when the cracks pass through the entire board thickness.



Cracked wall panels (left) and cracked shutter panel (right)

4. Summary and Conclusions

In general, the burn building is in good structural condition but requires some repairs. At this time, the most significant needs for the structure are:

- Seal cracks in concrete floor topping that are wider than 1/16".
- Remove corrosion and provide two coats of galvanizing repair paint on base plates and anchor bolts at structural wall panel intersections.
- Replace cracked Super Padgenite panels when cracks extend through the entire panel thickness.

If the repairs are made and if periodic repairs and maintenance of the structure and thermal linings are performed, the burn building should have a serviceable life of 20 years or more.

Note that this survey provides a general assessment of the condition of the burn building on the date of the survey. Live fire training and continued exposure to the elements will further degrade the burn building and its components. The condition of the burn building will change with the first live fire training evolution conducted after the survey. Therefore, there is no guarantee that the burn building will remain in its current condition for any length of time. If live fire training evolutions are conducted in the burn building before the recommended repairs and renovations are performed, or if a year elapses with no live fire training in the burn building before the recommended repairs and renovations are performed, then the findings of this report may become invalid and may require additional survey work.

Appendix 2
Glossary of Structural Terms

	separation is horizontal. If the separation falls out or disintegrates, the area becomes a *spall*. In a burn building, delaminations usually occur because (1) moisture within the concrete changes to steam when exposed to high temperatures, and the steam pressure separates the concrete, or (2) fuel used to ignite the fires soaks into the concrete and burns when exposed to high temperatures, increasing internal pressure.
Discoloration	Concrete exposed to high temperatures changes from its typical gray color to a pinkish, salmon color (above 600° F), a white color (above 1,100° F), or a tan, or buff color (above 1,700° F).
Efflorescence	Deposits of salts that form on the surface of concrete, *CMU*, or brick as a result of evaporation of the water in which the salts were dissolved. Usually an indication that moisture is passing through the structural material.
Expansion joint	Intentional gap through the entire thickness of a building element, such as a wall or a slab, to allow for expansion and contraction of the element when it is exposed to temperature changes. Expansion joints can be built into the element during original construction, or can be cut into the element at a later time. In a burn building, expansion joints are most commonly found in walls, especially near the corners of exterior walls and at the intersection of an interior and exterior wall.
Fire brick	Masonry brick, usually made of *fire clay*, especially made to withstand the effects of high heat without fusion or softening.
Fire clay	A natural clay which does not fuse or soften when subjected to high temperature. Fire clay typically contains fewer metallic oxides than other natural clays.
Grout	For application in filling hollow cells of *CMU* walls: a fluid concrete mix that will flow freely into masonry joints and cells within a wall to fill all voids solid. For application in filling a crack in a masonry wall or a gap between two elements: a stiff concrete mix that resembles masonry mortar and is trowelled into a crack or gap to seal the void.

Hollow core plank	*Precast concrete* structural slab element reinforced with prestressed steel cables. Typical plank size is 2'-0" wide x 6" or 8" thick x required length up to approximately 35'-0". Circular voids, approximately 4" to 5" in diameter, run the entire length of the plank to reduce the weight of the slab. After curing, planks are transported, lifted into place, and anchored to supporting beams or walls. A structural *concrete topping* is often placed on top of the planks after erection.
Lightgage metal joist	A horizontal structural framing element (joist) made of thin steel material, typically 12 gage or thinner. Most common cross section is C-shaped.
Lightgage metal stud	A vertical structural framing element (stud) made of thin steel material, typically 12 gage or thinner. Most common cross section is C-shaped.
Lintel	A horizontal beam placed across the top of a door or window opening to support the wall immediately above the opening. Lintels in a burn building are typically fabricated out of *precast concrete* or a reinforced masonry course. Lintels can also be fabricated out of steel angles, steel wide flange section (I-beam), stone, or wood.
Non-bearing wall	A non-structural wall, also called a partition, that divides the space into rooms but does not support floor or roof structures, or any other ceiling loads.
Petrographic analysis (concrete)	Removing a cylindrical sample of existing, in-place concrete with a core drill, slicing the core vertically and horizontally, and analyzing the core along the sliced faces. This test determines, among other properties, the physical composition, degree of cracking, and degree of cement paste degradation within the sampled core. Test is defined by *ASTM* C-856.
Pilaster	A rectangular column attached to a wall, so that the face of the column projects out from the face of the wall.
Poured-in-place reinforced concrete	Concrete reinforced with steel bars that is poured into forms and cured at its final location. Once the wet concrete cures, the forms are removed but the concrete is not relocated.

Pre-engineered metal building	A building constructed of standardized steel roof and wall assemblies, that is engineered by the manufacturer for typical column bay dimensions.
Pre-engineered wood truss	Truss element, typically fabricated out of conventional 2x lumber and steel nail plates, that is engineered by the manufacturer for given spans, configurations, and load requirements.
Precast concrete	Concrete reinforced with steel bars that is poured into forms and cured at a location other than its final location. Once the wet concrete cures, the forms are removed and the concrete element is transported, lifted, and anchored into its final location.
Precast prestressed hollow core concrete plank	See *hollow core plank.*
Pressure injection (for *crack* repair)	A concrete *crack* repair method usually made with epoxy. The typical repair sequence is to seal the exposed faces of the crack(s) with epoxy, drill small holes into the concrete at the cracks, and inject epoxy under pressure to completely fill the crack. If the shiny epoxy appearance at the face of the crack is undesirable, the epoxy that was applied to initially seal the exposed crack faces can be ground away to bare concrete.
Prestressed concrete	Concrete element reinforced with steel cable that is mechanically tensioned.
Prestressed concrete double tee	*Precast concrete* structural slab element, reinforced with prestressed steel cables, with a cross-section in the shape of a double tee (TT). After curing, the sections are transported, lifted into place, and anchored to supporting beams or walls.
Prism test (masonry)	Removal of a piece of masonry (CMU) wall at the mortar joints, typically 2'-0" height x 1'-6" length x wall thickness, compressing the sample in a machine until failure, and calculating the compressive strength of the sample from the measured test results. This test is significant because compressive strength of the masonry wall assembly (f'm) is an important masonry quality. Test is defined by *ASTM* E-447.

Refractory concrete	A special concrete product produced using calcium aluminate cement instead of standard portland cement. The aggregate can be either normal weight, lightweight, or calcium aluminate aggregates. The chemical composition of refractory concrete makes it more resistant to high temperatures and thermal shocks. It is less likely to spall or delaminate when first exposed to fires, compared to regular concrete made with portland cement. However, many older burn buildings with structural, reinforced, cast-in-place, refractory concrete slabs, beams, columns, and walls have large delaminations that are significant safety concerns. Refractory concrete is also known as "calcium aluminate concrete."
Reinforcing bar	A round, steel bar used to reinforce concrete or *CMU*. Typical bar diameters range between 3/8" and 2-1/4". Reinforcing bars are typically defined by *ASTM* A-615..
Repoint	To remove and replace mortar in the joints of a masonry wall.
Scaling	Small, shallow pits in a concrete surface, usually grouped in a small area. Scaling does not expose reinforcing and is smaller and shallower than a *spall.*
Slab-on-grade	A concrete slab element poured on, and permanently supported by, the ground.
Spall	An area in a concrete surface in which the outer surface has separated from the base concrete element and disintegrated, leaving a shallow crater in the surface. Spalls can occur on a vertical wall surface, a horizontal floor slab surface, or an overhead ceiling slab surface. In a burn building, spalls usually occur because (1) moisture within the concrete changes to steam when exposed to high temperatures, and the steam pressure separates the concrete, or (2) fuel used to ignite the fires soaks into the concrete and burns when exposed to high temperatures, increasing internal pressure.
Spread footing	A concrete foundation for a wall or column. The dimensions of a spread footing are larger than those of the supported element, so as to distribute the load across a larger area of supporting soil and reduce settlement. Also called a "footing" or a "footer".

Steel deck	Corrugated sheets fabricated from thin steel, typically 16 gage or thinner, that can be used in floor and roof construction. Steel deck is typically used in one of three ways: (1) as a structural support for a non-structural *concrete fill*; (2) as a non-structural element used only as a form for a structural concrete slab; (3) as a structural element that acts compositely with a structural *concrete topping*.
Steel joist	A horizontal structural framing element (joist) made of *structural steel* material that is a parallel-chord truss. Typically, the top and bottom chords of the joists are steel angles or bars, and the webs are steel bars.
Structural steel	Steel elements fabricated in shapes, such as wide flanges (I-beams), channels, angles, pipes, tubes, bars, and plates. These can be used as structural or non-structural elements.
Tensile test (reinforcing)	Removing a length of steel *reinforcing bar* from an existing, in-place concrete element, pulling the reinforcing sample in a machine until failure, and calculating the tensile strength of the sample from the measured test results. This test is significant because tensile strength is an important reinforcing quality. Test is defined by *ASTM* A-370.
Tensile test (structural steel)	Removing a length of existing *structural steel*, pulling the reinforcing sample in a machine until failure, and calculating the tensile strength of the sample from the measured test results. This test is significant because tensile strength is an important quality in structural steel. Test is defined by *ASTM* A-370.
Welded wire fabric	Reinforcing mesh fabricated from two layers of thin steel wires welded together, with the top layer perpendicular to the bottom layer. Wire spacing in each layer is typically 4" or 6".

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B2

Elliott, LeBoeuf & McElwain

Transmittal

Date: March 15, 2011

Delivery to: Gloucester Volunteer Fire & Rescue Squad Inc.
Attention: Gordon Townsend
Job Name: Gloucester Burn Building Structural Evaluation
EL&M No.: 11003

Received
MAR 17 2011
Public Works

Delivered by: Federal Express

Items: Report

Prepared by: Our office

Department of Fire Programs
NOV 19 2013
Administration

EL&M Action: For your use and information

Your Action: Please call if you have any questions

Comments: Thank you for the opportunity to provide you with our serivces. Please let us know if you need anything else, and we hope to work for you again the next time you need a structural evaluation of your burn building.

Regards,

By:

Roger M. LeBoeuf, P.E.
President

Copies to: N/A

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Report on the:

Structural Survey and Evaluation

At the:

Gloucester Live Fire Training Structure ("Burn Building")
EL&M No.: 11003

Prepared for:

Gloucester Volunteer Fire & Rescue Squad Inc.

Prepared by:

Roger M. LeBoeuf, P.E.
President

Date:

March 11, 2011

Department of ...
NOV 19 2013

Table of Contents

Table of Contents - Appendices

1. Introduction

1.1 Purpose of Survey

The "burn building" at the Gloucester, VA live fire training facility is a live fire training structure located at 7598 Dutton Rd., Gloucester, VA 23061. It is used for training firefighters in live fire training evolutions.

The purpose of this survey is to determine the extent of any structural damage and make recommendations. Accomplishing this purpose will keep the Owner in conformance with NFPA's requirements for structural surveys of the burn building for three years and with Virginia Department of Fire Programs' (VDFP's) requirements for one year.

1.2 Description of Survey at this Burn Building

To accomplish the purpose, Roger LeBoeuf, of Elliott, LeBoeuf & McElwain (EL&M), traveled to the site on March 10, 2011 to conduct a visual structural survey. Upon arriving at the burn building for the field survey, Mr. LeBoeuf interviewed Captain Gordon Townsend of Gloucester Volunteer Fire & Rescue Squad. The interview included a walk-through of the burn building. During this interview, Mr. LeBoeuf obtained information about the burn building history, condition, and use. Mr. Townsend pointed out damage and enumerated specific concerns about the burn building.

After the interview and walk-through, Mr. LeBoeuf conducted a non-destructive, visual structural survey of the burn building. Visual observations were made of exposed surfaces in every accessible room for the purpose of evaluating the general condition of the existing structural systems. Furthermore, the exposed top surfaces of the floor slab were sounded in an attempt to locate delaminations. The exterior was observed from the ground and accessible roof locations.

The survey did not include soils testing, materials testing, evaluation of structural load capacity, or evaluation of non-structural items, such as the gas prop and all of its safety devices, smoke distribution system, temperature monitoring system, electrical wiring, or any items beyond the exterior walls of the burn building. The only non-structural items included in the survey were doors, window shutters, guardrails, thermal linings, and any other items indicated in the report. The assessment of non-structural items was limited to a visual assessment of their general condition. Testing and inspections were not performed on the non-structural items. For example, door and shutter hinges were not inspected or tested for wear or risk of failure, but visible corrosion and warping on doors would have been noted. Thermal linings were not inspected for hairline cracking, anchor loosening, moisture content in the insulation boards, corrosion of the anchoring system, or ice damage, but missing panels, broken panels, and cracked panels would have been noted.

Evaluation of code compliance and other safety issues was not included in the scope of work. Code compliance issues such as door and window dimensions, egress requirements, and guardrail heights were not included.

This survey does not include a structural evaluation of load capacity or building stability. The scope of the evaluation was limited to an evaluation of the visible condition of structural elements. Therefore, evaluations of fuel loads, training temperatures, training procedures, and other operational items were not performed. Only rooms with two means of escape should be used as burn rooms.

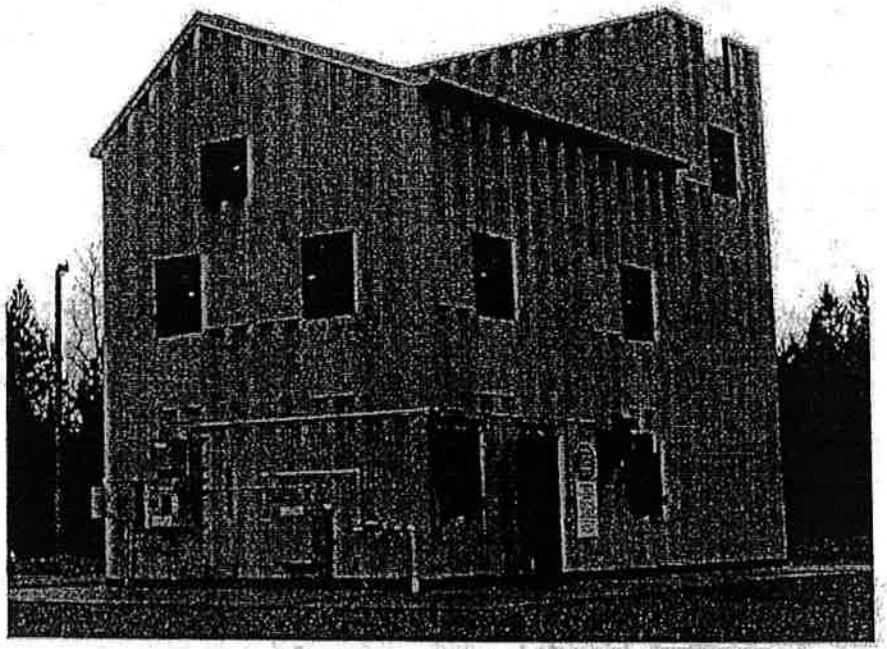
A partial set of the original architectural and structural drawings were available for review during the survey. These drawings were prepared by WHP of Overland Park, Kansas and dated March 14, 2007. The drawings were spot-checked in the field and were found to be a generally accurate representation of the exposed conditions. We have assumed that the drawings accurately reflect the as-built conditions of the existing structure, including the hidden conditions such as slab reinforcing.

The visual survey is a useful method for determining the general structural condition of the burn building. However, without exposing every hidden condition and without testing any of the structural materials for deterioration, the survey is not exhaustive. It is possible for damaged structural elements to appear undamaged at the exposed surface. There may be damage that was not detected during this survey and future damage can occur due to continued live fire training evolutions. Therefore, while it is believed that the survey and testing provides a good general assessment of the building condition, the results of this survey cannot be considered a warranty of the structural condition of the burn building. Furthermore, the survey results cannot be used, in themselves, as contract documents for repairs.

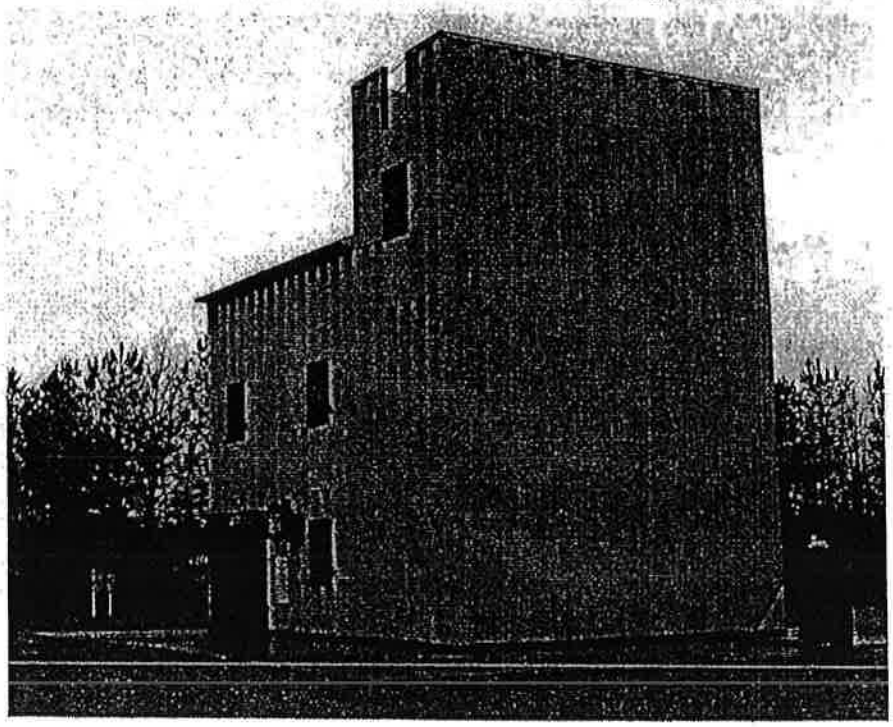
2. Burn Building Description

See Appendix 1 for approximate floor plans. For a glossary of all terms typed in *italics*, see Appendix 2.

The burn building is a three story pre-engineered steel structure measuring approximately 2,650 square feet. Most of the third floor is low headroom attic. There is currently one burn room (room used for live fire training). The burn building is approximately three years old (constructed in November, 2007).



CD Elevation (above) and BC Elevation (below)



2.1 Structural Systems

The burn building is a pre-engineered steel structure. The structure consists of *lightgage metal C joists* supporting lightgage metal deck, supported by corrugated structural wall panels. The second floor non-burn room has a non-structural concrete topping on the metal floor deck. The ground floor is a *slab-on-grade*. The walls are assumed to be supported on spread footings. These descriptions are based on the original drawings and observed conditions. The foundations were not excavated for observation.

2.2 Non-Structural Features

The non-structural features are described in the table below.

Element	Description
Exterior & Interior Doors	Hollow metal door
Windows	Hollow metal shutters with locking mechanism.
Roof Hatch	Bilco roof hatch.
Floor Hatch	Bilco floor hatch
Thermal Lining	Padgenite (or possibly Super Padgenite) insulating panels (1" thick calcium silicate insulation boards) on interior wall and ceiling surfaces of the burn room only, mounted on steel stud partitions and hung from steel hat channels from the ceiling structure.

2.3 Use of Facility, Based on Questionnaire and Interview with Facility Personnel

The following table describes the general use of this burn building, as provided by personnel from the facility. The information provided in this table gives an indication of the general care and condition of the burn building. Typically, one can expect to observe more damage in the building if there are one or more of the following: higher temperatures, frequent training evolutions, misuse, no thermal protection, and no routine maintenance.

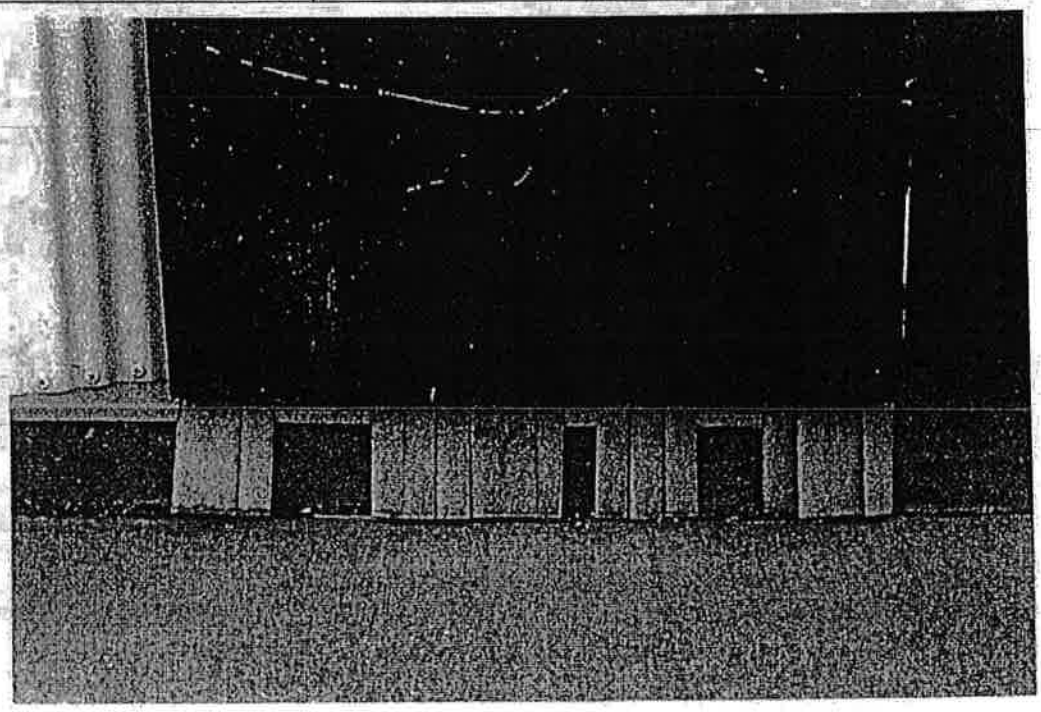
Item	Information Provided by Captain Gordon Townsend
Personnel that use the burn building	Gloucester VFD, marine training company in the area, open to anybody in the area that wants to use the building for training, such as Middlesex and Matthews.
Degree of supervision (See Note 1 below)	Always by Gloucester personnel for Gloucester training. Other certified instructors can supervise training of non-Gloucester personnel if they are known to Gloucester and follow Gloucester procedures.
Number of live fire training days (days during which at least one fire was set) per year in this burn building	Approximately 20 to 25. Used additional days for non-live-fire training.
Temperature range during training	Maximum 700 degrees at the five-foot level.
Typical fuel used for one evolution	LP gas prop.
Damage to the structure that has either changed training routine or raised concerns about safety	None.
Past repairs and renovations	Changed burn room from Class A to LP, per VDFP revised requirement, and enlarged burn room. Eliminated ventilation chopout because of leaks and no safety railings and built prop on the ground. Replaced broken handle on vent door in burn room. Added chains and hooks to doors in order to keep them in open position. Window at D side of building on third floor bolted shut for safety.
Maintenance history	Calibrated original temperature monitoring system (TMS) with Kidde TMS and added light/alarm to original TMS..
Planned changes for the future	Add second burn room upstairs, if required by VDFP, and perhaps add exterior fire escape stair.
Other information	None.

Note 1: "Degree of supervision" indicates the degree to which the local fire training academy supervises training at the burn building. This supervision requires personnel from the local fire training academy to either be the instructors or to observe the evolutions conducted by an outside instructor. It has been noted during past surveys that "unsupervised training" often results in misuse of the building, including burning at temperatures that are too high and burning in rooms that are classified as "no burn" rooms.

3. Observations and Recommended Actions

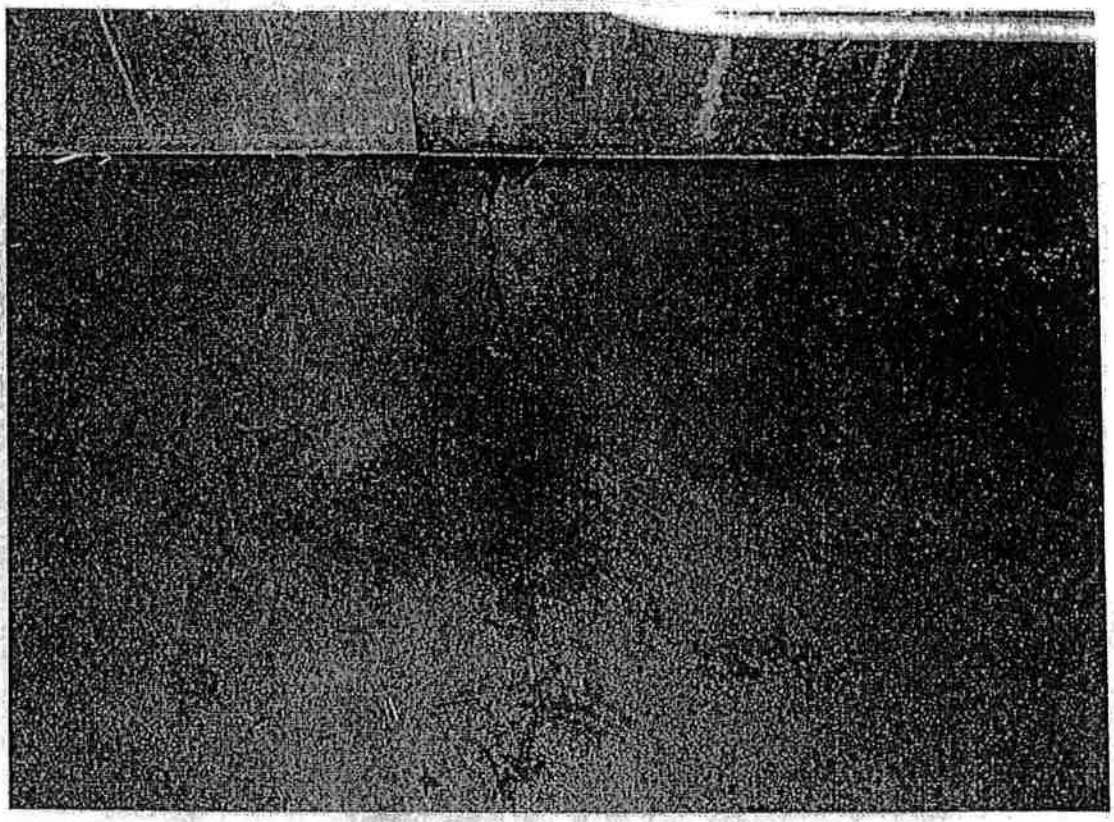
The following defects were observed. Recommended actions for repairing the defects are provided in the following table.

Item	Observations and Recommended Actions
Doors and Windows (Items 1, 2, and 8 in Appendix 1 Field Notes)	Observations: Minor corrosion and peeling paint on hollow metal doors, shutters, shutter magnets, and frames. Window shutter magnets do not consistently hold shutters in open position if there is a breeze. At the bottoms of all exterior doors, some of the flaps that keep light out during training are missing. Recommended Actions: No repair required. At Owner's option, improve system for holding window shutters open and replace missing flaps at bottoms of doors.



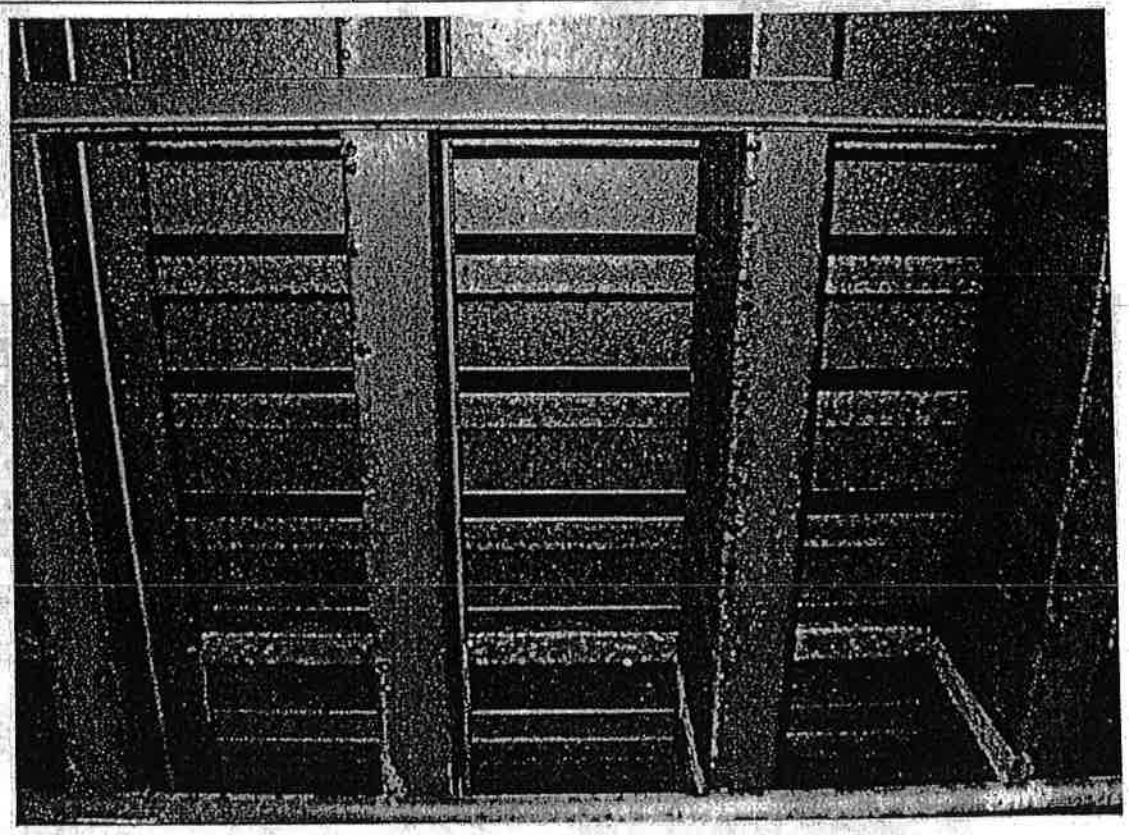
Minor corrosion on door and missing flaps at bottom of door.

Item	Observations and Recommended Actions
Concrete ground floor slab (Item 3 in Appendix 1 field notes)	Observations: Minor *cracks*, most likely due to concrete shrinkage during the initial curing, in the top surface of the ground floor slab. Recommended Actions: No repair required since the concrete is likely non-structural and since the cracks are minor. Observe cracks periodically to determine if their condition is worsening. Should any crack grow to exceed 1/16" in width, then repairs will be required.

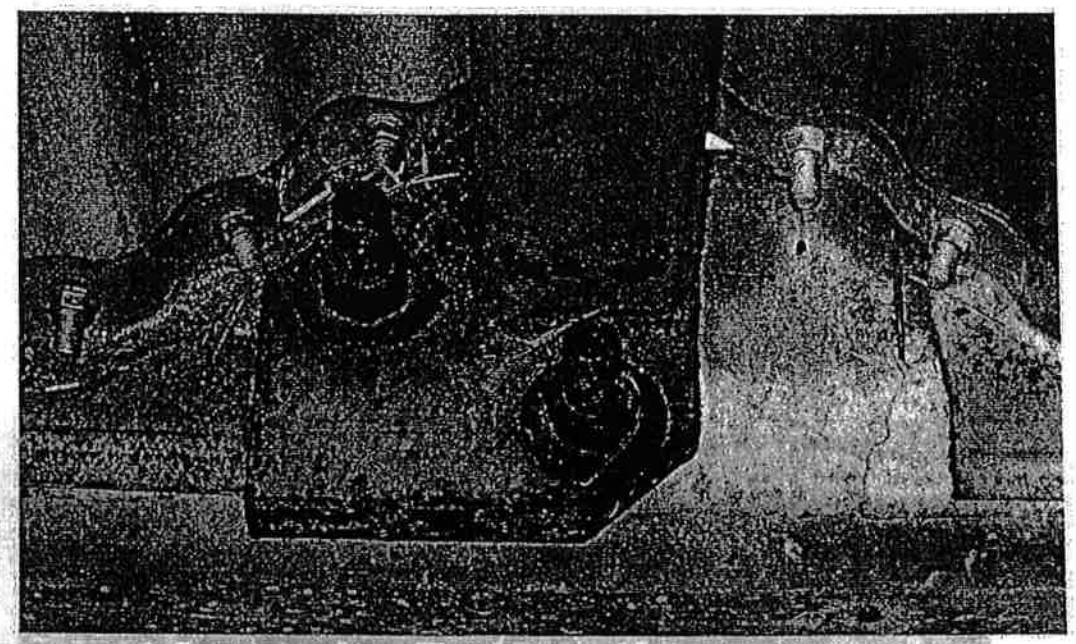


Minor crack in ground floor slab

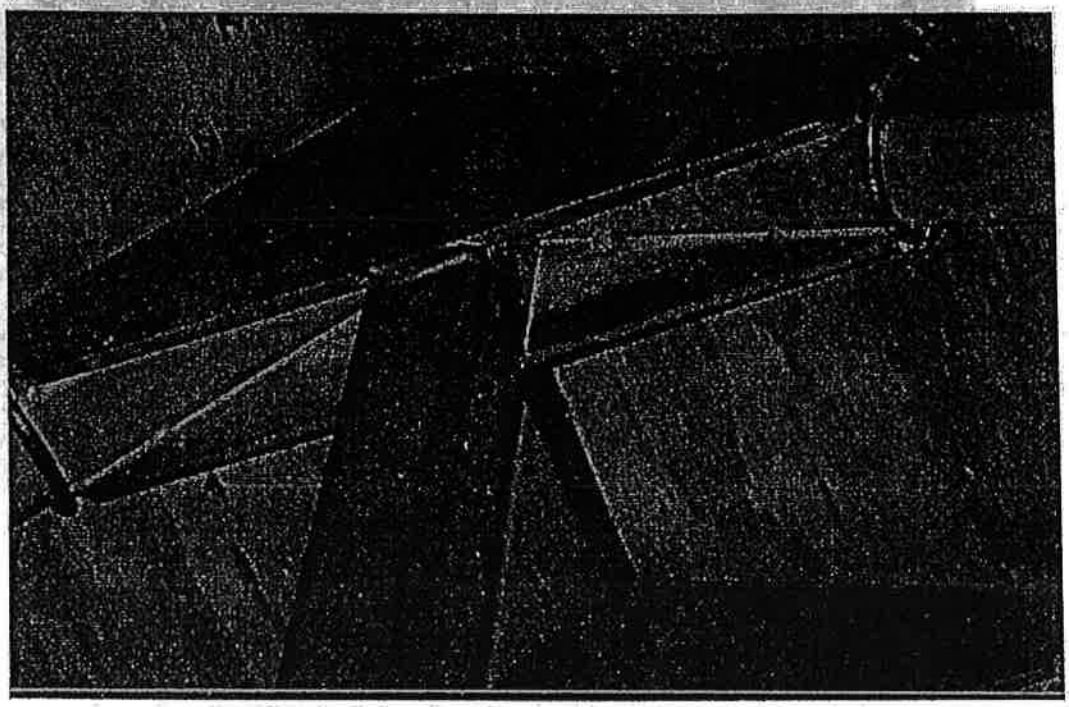
Item	Observations and Recommended Actions
Steel Framing (Items 4, 5, and 13 in Appendix 1 field notes)	Observations: There is minor corrosion on the steel framing, including floor and roof deck, C joists, roof trusses, wall studs, corrugated wall panels, and column base plates and anchor bolts throughout the structure. Recommended Actions: No repair is required at this time because the corrosion appears to be minor surface rust. Monitor the corrosion, which is currently most severe at the column anchor bolts. If it worsens, corrosion removal and re-coating could be required.



Minor corrosion on ceiling deck and C joists.

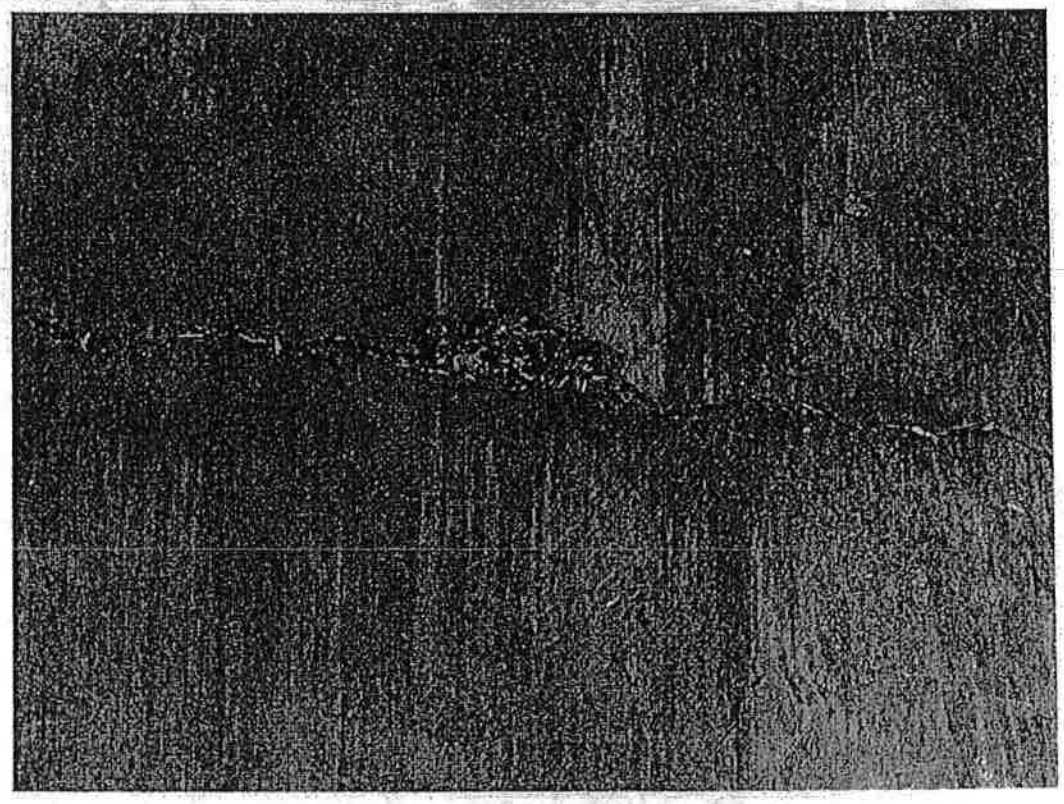


Minor corrosion column anchor bolts.

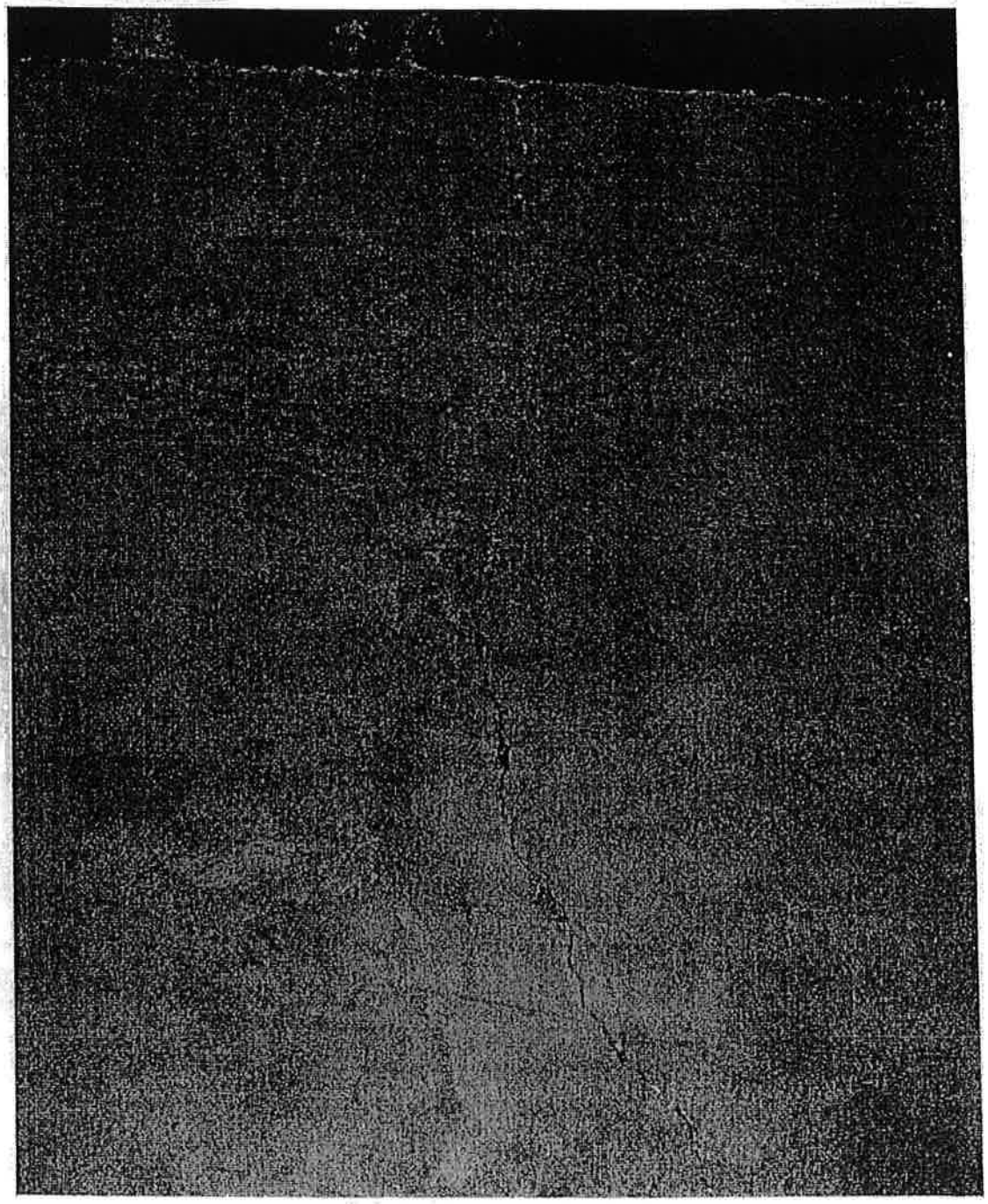


Minor corrosion on roof trusses.

Item	Observations and Recommended Actions
Concrete topping at floors and roof (Items 10 and 11 in Appendix 1 field notes)	Observations: Minor to moderate *cracks*, most likely due to concrete shrinkage during the initial curing and lack of expansion joints during the initial cure, in the top surface of the concrete topping at the second floor. Minor *spall* at location where intersecting cracks causes concrete to become too loose. Recommended Actions: Rout and seal cracks with an exterior quality, flexible sealant, such as Sikaflex 1a. Patch spall with a high-strength, high bond strength, non-shrink grout, such as SikaTop 123 Plus.

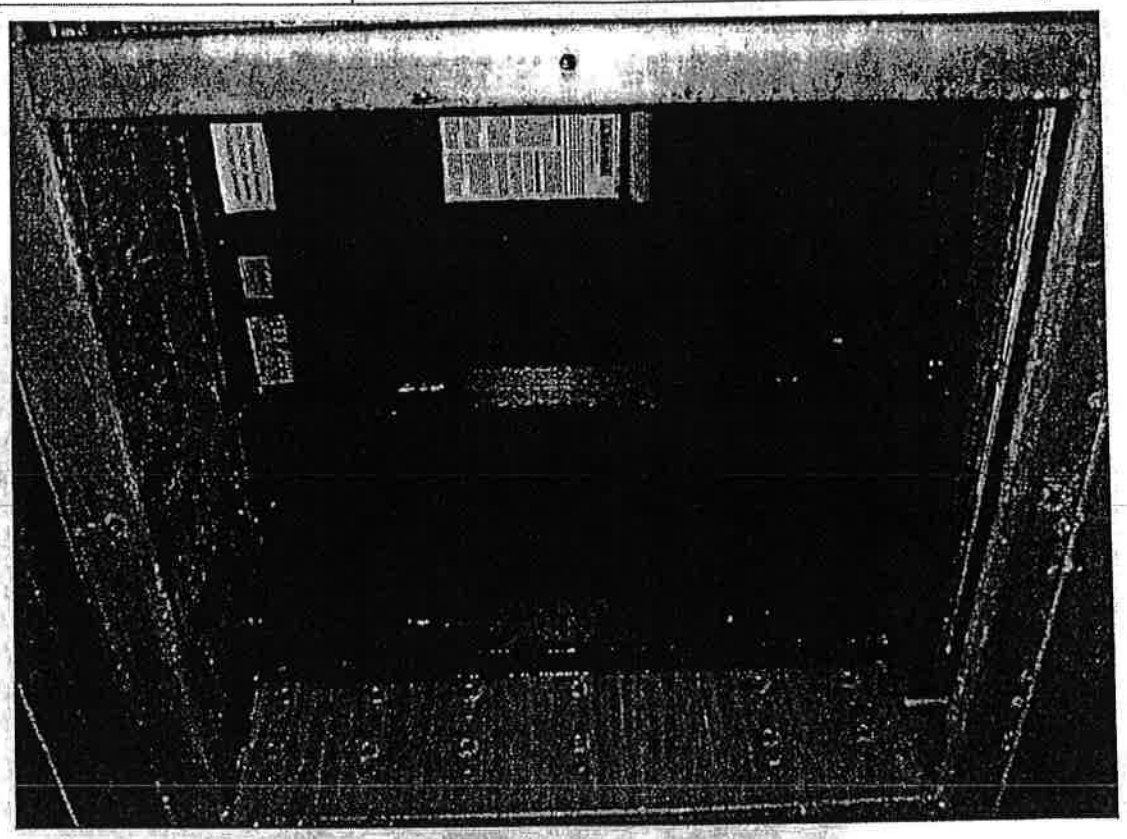


Spall in second floor concrete topping.



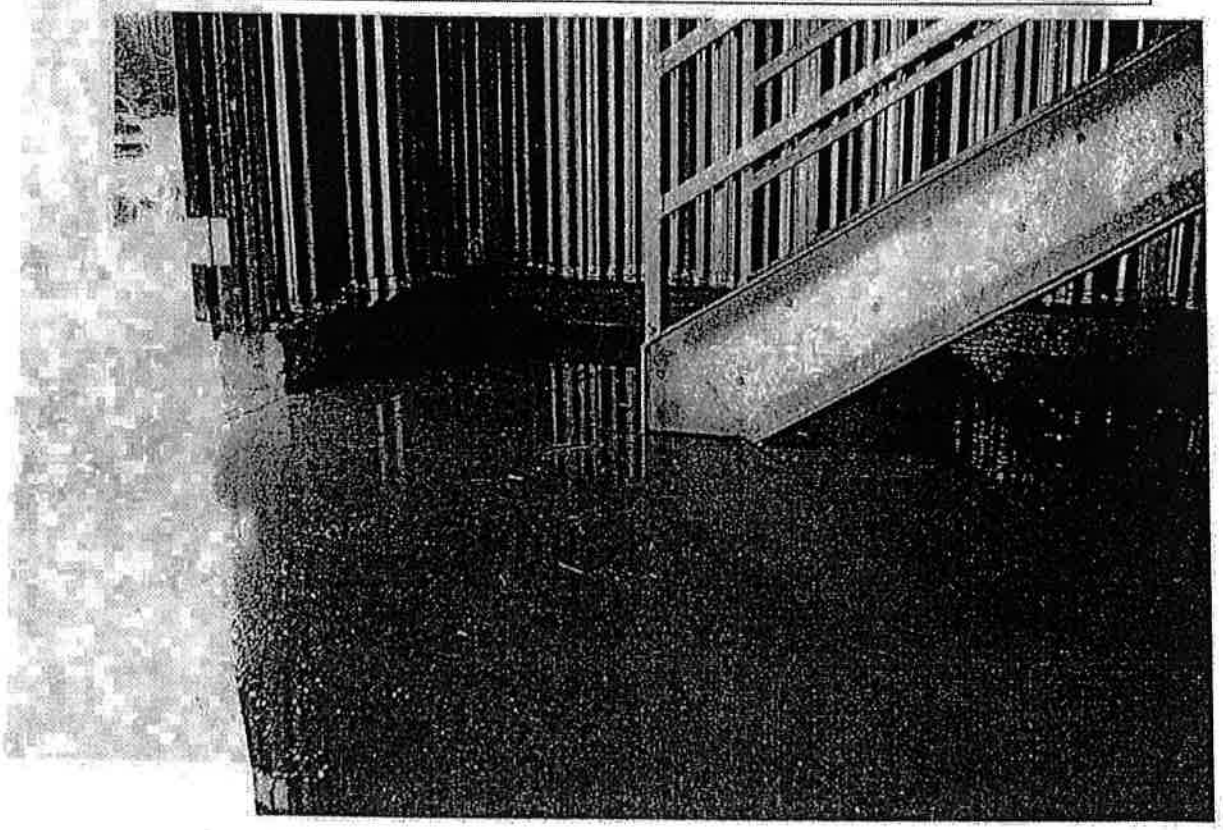
Crack in second floor concrete topping.

Item	Observations and Recommended Actions
Floor and Roof hatches (Item 12 in Appendix 1 field notes)	Observations: Minor corrosion on floor and roof hatches and framing around openings. Recommended Actions: No repair required.



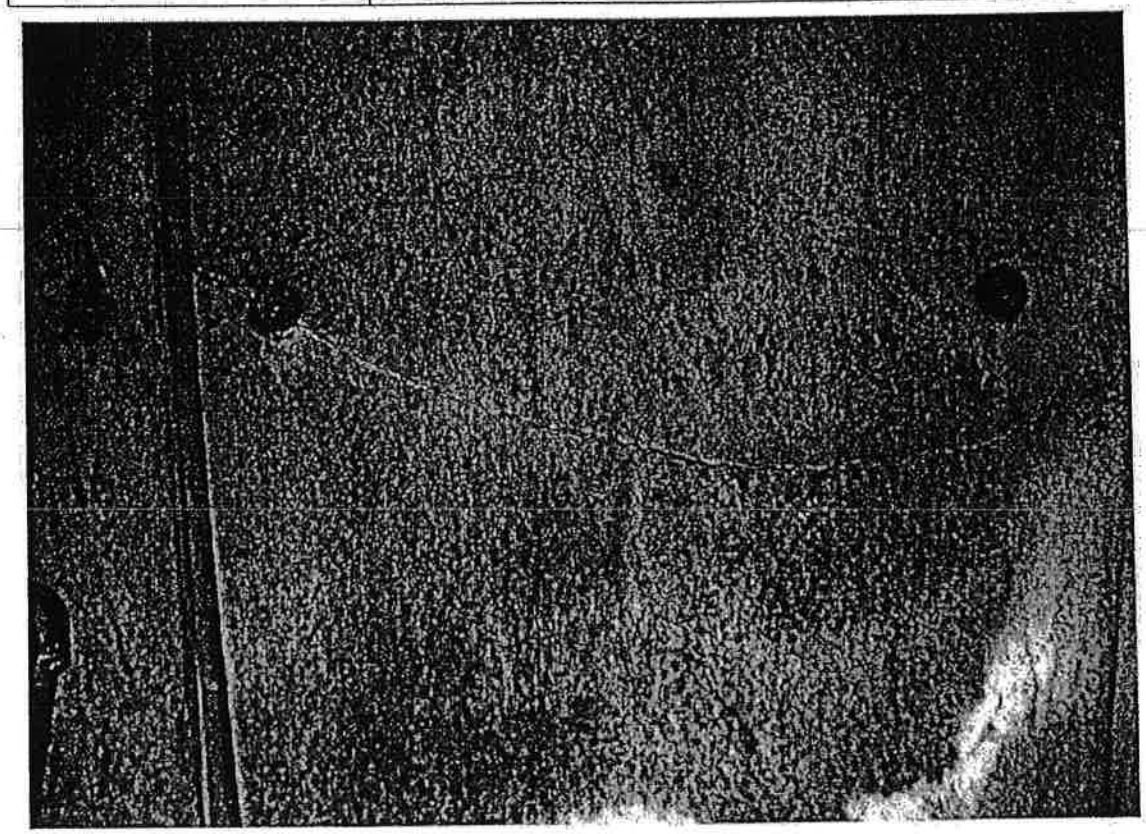
Minor corrosion on second floor hatch.

Item	Observations and Recommended Actions
Leaks (Item 9 in Appendix 1 field notes)	Observations: The structure leaks in many locations, especially in the stair tower, due to the detailing of the pre-engineered building manufacturer. Recommended Actions: No action required.



Ponding at first floor of stair tower due to leaks throughout structure.

Item	Observations and Recommended Actions
Thermal Lining (Items 6 and 7 in Appendix 1 field notes)	Observations: There are two cracked Padgenite wall panels in the burn corner of Room 100, in which the cracks penetrate through the entire panel thickness, plus one cracked panel on the window shutter (which does not appear to penetrate through the entire panel thickness). Recommended Actions: Confirm with Kidde that the temperature at the crack locations in the two wall panels (approximately 2' above the floor behind the gas prop) will be less than 300 degrees F. If so, then no action required.



Cracked wall panel.

4. Summary and Conclusions

In general, the burn building is in good structural condition but requires some repairs. At this time, the most significant needs for the structure are:

- In Room 200, rout and seal cracks with an exterior quality, flexible sealant, such as Sikaflex 1a. Patch spall with a high-strength, high bond strength, non-shrink grout, such as SikaTop 123 Plus.

- For the two cracked Padgenite panels near the bottom of the wall adjacent to the gas prop, confirm with Kidde that the temperature at the crack locations in the two wall panels (approximately 2' above the floor behind the gas prop) will be less than 300 degrees F. If so, then no further action required.

If the repairs are made and if periodic repairs and maintenance of the structure and thermal linings are performed, the burn building should have a serviceable life of 20 years or more.

Note that this survey provides a general assessment of the condition of the burn building on the date of the survey. Live fire training and continued exposure to the elements will further degrade the burn building and its components. The condition of the burn building will change with the first live fire training evolution conducted after the survey. Therefore, there is no guarantee that the burn building will remain in its current condition for any length of time. If live fire training evolutions are conducted in the burn building before the recommended repairs and renovations are performed, or if a year elapses with no live fire training in the burn building before the recommended repairs and renovations are performed, then the findings of this report may become invalid and may require additional survey work.

Appendix 1
Approximate Floor Plans and Field Notes

Appendix 2
Glossary of Structural Terms

Glossary of Terms

Term	Definition
ACI 318	"Building Code Requirements for Reinforced Concrete", published by the American Concrete Institute (ACI). This concrete code is referenced by the Building Code and provides design standards for reinforced concrete construction.
ASTM	American Society for Testing and Materials. The standards written by ASTM are widely used in the construction and building design industry, and are referenced by the Building Codes.
Bearing wall	A structural wall which supports the roof and elevated floor structures.
Bond beam	A continuous horizontal masonry course, usually at or near a roof or floor elevation, that ties the building together around its perimeter. It can also serve to support roof or floor loads over *non-bearing walls* or wall openings. A *CMU* bond beam is typically constructed of U-shape block filled with *grout*, with continuous *reinforcing bars* running parallel to the course.
Calcium Aluminate Concrete	A special concrete product produced using calcium aluminate cement instead of standard portland cement. The aggregate can be either normal weight, lightweight, or calcium aluminate aggregates. The chemical composition of calcium aluminate concrete makes it more resistant to high temperatures and thermal shocks. It is less likely to spall or delaminate when first exposed to fires, compared to regular concrete made with portland cement. However, many older burn buildings with structural, reinforced, cast-in-place, calcium aluminate concrete slabs, beams, columns, and walls have large delaminations that are significant safety concerns. Calcium aluminate concrete is also known as "refractory concrete."

Refractory concrete	A special concrete product produced using calcium aluminate cement instead of standard portland cement. The aggregate can be either normal weight, lightweight, or calcium aluminate aggregates. The chemical composition of refractory concrete makes it more resistant to high temperatures and thermal shocks. It is less likely to spall or delaminate when first exposed to fires, compared to regular concrete made with portland cement. However, many older burn buildings with structural, reinforced, cast-in-place, refractory concrete slabs, beams, columns, and walls have large delaminations that are significant safety concerns. Refractory concrete is also known as "calcium aluminate concrete."
Reinforcing bar	A round, steel bar used to reinforce concrete or *CMU*. Typical bar diameters range between 3/8" and 2-1/4". Reinforcing bars are typically defined by *ASTM* A-615..
Repoint	To remove and replace mortar in the joints of a masonry wall.
Scaling	Small, shallow pits in a concrete surface, usually grouped in a small area. Scaling does not expose reinforcing and is smaller and shallower than a *spall.*
Slab-on-grade	A concrete slab element poured on, and permanently supported by, the ground.
Spall	An area in a concrete surface in which the outer surface has separated from the base concrete element and disintegrated, leaving a shallow crater in the surface. Spalls can occur on a vertical wall surface, a horizontal floor slab surface, or an overhead ceiling slab surface. In a burn building, spalls usually occur because (1) moisture within the concrete changes to steam when exposed to high temperatures, and the steam pressure separates the concrete, or (2) fuel used to ignite the fires soaks into the concrete and burns when exposed to high temperatures, increasing internal pressure.
Spread footing	A concrete foundation for a wall or column. The dimensions of a spread footing are larger than those of the supported element, so as to distribute the load across a larger area of supporting soil and reduce settlement. Also called a "footing" or a "footer".

Steel deck	Corrugated sheets fabricated from thin steel, typically 16 gage or thinner, that can be used in floor and roof construction. Steel deck is typically used in one of three ways: (1) as a structural support for a non-structural *concrete fill*; (2) as a non-structural element used only as a form for a structural concrete slab; (3) as a structural element that acts compositely with a structural *concrete topping*.
Steel joist	A horizontal structural framing element (joist) made of *structural steel* material that is a parallel-chord truss. Typically, the top and bottom chords of the joists are steel angles or bars, and the webs are steel bars.
Structural steel	Steel elements fabricated in shapes, such as wide flanges (I-beams), channels, angles, pipes, tubes, bars, and plates. These can be used as structural or non-structural elements.
Tensile test (reinforcing)	Removing a length of steel *reinforcing bar* from an existing, in-place concrete element, pulling the reinforcing sample in a machine until failure, and calculating the tensile strength of the sample from the measured test results. This test is significant because tensile strength is an important reinforcing quality. Test is defined by *ASTM* A-370.
Tensile test (structural steel)	Removing a length of existing *structural steel*, pulling the reinforcing sample in a machine until failure, and calculating the tensile strength of the sample from the measured test results. This test is significant because tensile strength is an important quality in structural steel. Test is defined by *ASTM* A-370.
Welded wire fabric	Reinforcing mesh fabricated from two layers of thin steel wires welded together, with the top layer perpendicular to the bottom layer. Wire spacing in each layer is typically 4" or 6".

Cement Matrix Deterioration	Chemical breakdown of the cement paste in concrete or *CMU* due to high temperatures and flame impingement. This deterioration manifests itself as pitting, dusting, or eroding of the exposed concrete or CMU surface.
CMU	Concrete Masonry Unit, also referred to as concrete block, cinder block, or block. These blocks are made of concrete, are typically hollow but can be solid, and are typically 16" long x 8" high x a thickness of 6", 8", or 12" (nominal dimensions). CMU is typically defined by *ASTM* C-90.
Compression test (concrete)	Removing a cylindrical sample of existing, in-place concrete with a core drill, compressing the concrete sample in a machine until failure, and calculating the compressive strength of the sample from the measured test results. This test is significant because compressive strength is an important concrete quality. Test is defined by *ASTM* C-42.
Concrete fill	Non-structural, low-grade concrete placed on top of a structural element such as a structural concrete slab or *steel deck*. Typical uses for concrete fill include insulation, achieving roof slope, providing a smooth finish, and moisture protection for steel deck.
Concrete topping	Structural or non-structural concrete poured on top of a structural element, such as composite *steel deck* or *precast prestressed hollow core plank*, to provide a smooth finish and/or additional structural capacity.
Crack	An unintentional break in a building material, such as concrete or *CMU*, that can be through a partial depth or the entire depth of the material. In a burn building, there can be several causes of cracks, but the most common ones are (1) expansion and contraction of the concrete or CMU during heating and cooling causing excessive stress within the material, (2) shrinkage of the concrete during the original curing process (not related to fire training evolutions).
Crazing	Narrow, shallow surface cracks in concrete that separate the surface into small, irregularly shaped, contiguous areas.
Delamination	A separation along a plane, generally parallel to the concrete surface, causing the surface to become loose though still in place. In a wall, the separation is vertical. In a slab, the

	separation is horizontal. If the separation falls out or disintegrates, the area becomes a *spall*. In a burn building, delaminations usually occur because (1) moisture within the concrete changes to steam when exposed to high temperatures, and the steam pressure separates the concrete, or (2) fuel used to ignite the fires soaks into the concrete and burns when exposed to high temperatures, increasing internal pressure.
Discoloration	Concrete exposed to high temperatures changes from its typical gray color to a pinkish, salmon color (above 600° F), a white color (above 1,100° F), or a tan, or buff color (above 1,700° F).
Efflorescence	Deposits of salts that form on the surface of concrete, *CMU*, or brick as a result of evaporation of the water in which the salts were dissolved. Usually an indication that moisture is passing through the structural material.
Expansion joint	Intentional gap through the entire thickness of a building element, such as a wall or a slab, to allow for expansion and contraction of the element when it is exposed to temperature changes. Expansion joints can be built into the element during original construction, or can be cut into the element at a later time. In a burn building, expansion joints are most commonly found in walls, especially near the corners of exterior walls and at the intersection of an interior and exterior wall.
Fire brick	Masonry brick, usually made of *fire clay*, especially made to withstand the effects of high heat without fusion or softening.
Fire clay	A natural clay which does not fuse or soften when subjected to high temperature. Fire clay typically contains fewer metallic oxides than other natural clays.
Grout	For application in filling hollow cells of *CMU* walls: a fluid concrete mix that will flow freely into masonry joints and cells within a wall to fill all voids solid. For application in filling a crack in a masonry wall or a gap between two elements: a stiff concrete mix that resembles masonry mortar and is trowelled into a crack or gap to seal the void.

Hollow core plank	*Precast concrete* structural slab element reinforced with prestressed steel cables. Typical plank size is 2'-0" wide x 6" or 8" thick x required length up to approximately 35'-0". Circular voids, approximately 4" to 5" in diameter, run the entire length of the plank to reduce the weight of the slab. After curing, planks are transported, lifted into place, and anchored to supporting beams or walls. A structural *concrete topping* is often placed on top of the planks after erection.
Lightgage metal joist	A horizontal structural framing element (joist) made of thin steel material, typically 12 gage or thinner. Most common cross section is C-shaped.
Lightgage metal stud	A vertical structural framing element (stud) made of thin steel material, typically 12 gage or thinner. Most common cross section is C-shaped.
Lintel	A horizontal beam placed across the top of a door or window opening to support the wall immediately above the opening. Lintels in a burn building are typically fabricated out of *precast concrete* or a reinforced masonry course. Lintels can also be fabricated out of steel angles, steel wide flange section (I-beam), stone, or wood.
Non-bearing wall	A non-structural wall, also called a partition, that divides the space into rooms but does not support floor or roof structures, or any other ceiling loads.
Petrographic analysis (concrete)	Removing a cylindrical sample of existing, in-place concrete with a core drill, slicing the core vertically and horizontally, and analyzing the core along the sliced faces. This test determines, among other properties, the physical composition, degree of cracking, and degree of cement paste degradation within the sampled core. Test is defined by *ASTM* C-856.
Pilaster	A rectangular column attached to a wall, so that the face of the column projects out from the face of the wall.
Poured-in-place reinforced concrete	Concrete reinforced with steel bars that is poured into forms and cured at its final location. Once the wet concrete cures, the forms are removed but the concrete is not relocated.

Pre-engineered metal building	A building constructed of standardized steel roof and wall assemblies, that is engineered by the manufacturer for typical column bay dimensions.
Pre-engineered wood truss	Truss element, typically fabricated out of conventional 2x lumber and steel nail plates, that is engineered by the manufacturer for given spans, configurations, and load requirements.
Precast concrete	Concrete reinforced with steel bars that is poured into forms and cured at a location other than its final location. Once the wet concrete cures, the forms are removed and the concrete element is transported, lifted, and anchored into its final location.
Precast prestressed hollow core concrete plank	See *hollow core plank*.
Pressure injection (for *crack* repair)	A concrete *crack* repair method usually made with epoxy. The typical repair sequence is to seal the exposed faces of the crack(s) with epoxy, drill small holes into the concrete at the cracks, and inject epoxy under pressure to completely fill the crack. If the shiny epoxy appearance at the face of the crack is undesirable, the epoxy that was applied to initially seal the exposed crack faces can be ground away to bare concrete.
Prestressed concrete	Concrete element reinforced with steel cable that is mechanically tensioned.
Prestressed concrete double tee	*Precast concrete* structural slab element, reinforced with prestressed steel cables, with a cross-section in the shape of a double tee (TT). After curing, the sections are transported, lifted into place, and anchored to supporting beams or walls.
Prism test (masonry)	Removal of a piece of masonry (CMU) wall at the mortar joints, typically 2'-0" height x 1'-6" length x wall thickness, compressing the sample in a machine until failure, and calculating the compressive strength of the sample from the measured test results. This test is significant because compressive strength of the masonry wall assembly (f'm) is an important masonry quality. Test is defined by *ASTM* E-447.

DEPARTMENT OF PUBLIC WORKS
P.O. Box 329
Gloucester, Virginia 23061

Birkhofer Building
6515 Main Street

BUILDINGS & GROUNDS
(804) 693-5250

ENGINEERING
(804) 693-5480

Section E.1.a.
Project Budget Estimate

Remove and replace roof	$20,071.70
A/E Services	$5,000.00
Total estimated cost	$25,071.70

Please reference attached quote from WHP Trainingtowers dated September 4, 2013. In order to provide safety and continuity with the original construction, the County intends to follow a sole-source purchasing method with WHP, the original building contractor. However, to formulate the budget price, 10% has been added to WHP's quote to account for the possibility that WHP may decline the proposed work, or the County may be required to seek competitive bids for other reasons.

The A/E price is a budget figure to cover any design costs that VDFP may deem necessary as well as to provide a certification at the project completion.

D

September 4, 2013 Reference: 13-322

Steven Zeliff (CIV)
Instructor/ Writer
Marine / Shipboard Firefighting
Maritime & Intermodal Training Dept.
U.S Army Transportation School

Email: steven.j.zeliff.ctr@mail.mil
Phone: 757-878-6324

Re: Roof Renovation @ Gloucester Fire Department, VA

Dear Mr. Zeliff,

We are pleased to provide you with the following pricing to renovate your existing burn building roof. We will supply all necessary freight, drawings, hat channel, roof decking, fasteners and misc. materials for proper repairs as follows:

Item #1: Renovation of existing Burn Building Roof

- Remove existing composition roof
- Remove trim and flashing
- Remove plywood roof sheathing
- Prep trusses for attachment of new materials
- Install 18ga hat channel perlins and 18ga G60 galvanized "F" roof deck
- Reinstall trim and flashing

Total Price For Item #1: **$18,247.00**

Price is base on 550sf roof and one trip to accomplish all work.

We exclude taxes, bond, permits, prevailing wage, dumpster, special insurance requirements if any, general condition items and other miscellaneous fees.

We would require 4-6 weeks after receipt of order and approval of drawings to complete delivery. Contractor will be responsible for off loading and storing of materials so as not to be damaged by exposure to weather.

Quote is good for 30 days and we will invoice when materials are shipped. Terms are net 20 days.

We hope you find this proposal acceptable and look forward to working with you.

Sincerely,

Bob Pottberg

Bob Pottberg
WHP Trainingtowers
800-351-2525

Cc: Jim Eicholtz

Virginia State Contractors License Number: Class A 2705 095646A

AT A MEETING OF THE GLOUCESTER COUNTY BOARD OF SUPERVISORS, HELD ON WEDNESDAY, NOVEMBER 6, 2013, AT 7:00 P.M., IN THE COLONIAL COURTHOUSE, 6504 MAIN STREET, GLOUCESTER, VIRGINIA: ON A MOTION DULY MADE BY MR. CHRISCOE AND SECONDED BY MR. ORTH,THE FOLLOWING RESOLUTION WAS ADOPTED BY THE FOLLOWING VOTE:

Carter M. Borden, yes;
Ashley C. Chriscoe, yes;
Christopher A. Hutson, yes;
Andrew James, Jr., absent;
John H. Northstein, yes;
Robert J. Orth, yes;
Louise D. Theberge, yes;

Received
NOV 12 2013
Public Works

RESOLUTION AUTHORIZING APPLICATION FOR A GRANT TO THE VIRGINIA DEPARTMENT OF FIRE PROGRAMS FOR ROOF MODIFICATIONS TO THE FIRE TRAINING FACILITY

WHEREAS, the County has been notified by the Virginia Department of Fire Programs (VDFP) that a burn building audit was completed on the Fire Training Facility in Dutton; and

WHEREAS, a deficiency was found in the previously approved existing roof such that it does not meet VDFP standards, which threatens training certification; and

WHEREAS, it is estimated to cost approximately $25,072 to correct the deficiency; and

WHEREAS, VDFP also has grant monies available for localities needing to correct deficiencies; and

WHEREAS, Gloucester County considers it in the best public interest to apply for funding to replace the roof at the Fire Training Facility to meet current VDFP standards.

NOW, THEREFORE, BE IT RESOLVED by the Gloucester County Board of Supervisors that the County Administrator be, and hereby is, authorized to execute a grant application as required for the Virginia Department of Fire Programs.

A Copy Teste:

Brenda G. Garton, County Administrator